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Original Communications

SENSORY PATHWAYS OF THE OVARIAN PLEXUS*

AN EXPERIMENTAL STUDY

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THE purpose of the present study was to determine the segmental distribution of the sensory pathways from the ovarian plexus to the central nervous system.

Such an investigation should provide a basis for interpretation of various reflex phenomena (viscerosensory and visceromotor) which are associated with certain pathologic conditions of some of the abdominal and pelvic organs. Moreover, exact knowledge of the distribution of the different fibers may facilitate more precise and less extensive surgical procedures for the relief of pain when such steps are indicated.

In addition, studies of this type should provide a logical approach to the study of the normal functions subserved by the many sensory connections from the female genital tract. If the chief morphologic features of these pathways, motor as well as sensory, are known, stimulation or destruction of selected reflex arcs will be possible. By such procedures the rôle of the innervation of the female genital tract may be ascertained without resorting to extensive and unnecessary sympathectomy. The extensive sympathectomies so far employed may

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result in a physiologically abnormal animal, and they have yielded no tangible results which reveal the functions of the abundant innervation of the uterus, tubes, and ovaries.

The method employed in this study is based on the well-known stimulating effect on respiration and blood pressure, resulting from electrical stimulation of peripheral sensory nerves. A number of recent investigators have utilized this method to study sensory effects from certain viscera. Thus Shrager and Ivy (1928) and Davis and others (1932) showed that when the gallbladder of a cat is distended certain reflex effects, such as increased respiratory movements, salivation, and distress, occur. Likewise, Acheson and others (1936) presented evidence to show that the contraction of the nictitating membranes, an increase in blood pressure, respiration and heart rate result reflexly from stimulation of sensory somatic or autonomic nerves whose central connections are intact.

In the present experiments we also have utilized the increase in blood pressure and respiratory movements resulting from strong faradic stimulation of various components of the ovarian plexus and the absence of such effects when essential pathways have been severed. By appropriate application of these procedures, which are given in detail below, we have investigated (1) the origin of the afferent fibers of the ovarian plexus; (2) the course of the sensory components; and (3) their central distribution within the main ganglionated sympathetic trunk.

METHODS

Animals.—Nine cats were used in this study. In seven, sensory nerves from both ovarian plexuses were stimulated. Thus a total of sixteen ovarian plexuses were studied.

Five of the animals, two of which were near term, were pregnant. Three cats were nonpregnant and one was in a postpartum state with good involution. In the latter animal a number of small follicles were present in the ovaries. The reproductive states of the cats did not affect the results described below, however.

Anesthesia.—In the first few experiments 0.7 c.c. of dial (Ciba) per kilogram of body weight was used. However, this produced a deep anesthesia which affected adversely the reflex responses to faradic stimulation. Later we found that 0.4 c.c. per kilogram maintained the animal in light anesthesia without depressing the reflexes to any great extent.

Ether was given by inhalation during the preliminary operative procedures of inserting the carotid cannula and the respiratory trocar and performing laparotomy. The re-enforcement with ether to produce first plane of anesthesia prevented the onset of shock and eliminated movements and distress which later might interfere with normal reflex responses to electrical stimulation.

Recording Technic.—Changes in blood pressure were registered through a carotid cannula. Respiratory movements were recorded by means of a trocar which was plunged into the pleural cavity through the sixth or seventh costal interspace in the anterolateral aspect of the chest. The trocar was connected by a rubber tubing

to a tambour by means of which the kymographic tracings were obtained. This method was simple, produced little trauma and registered minute fluctuations in rate and depth of the respiratory excursions.

A strong faradic current was used for stimulation. After the sensitive area about the ovarian vessels in the broad ligament was found, a shielded electrode was applied at this point. The electrode was tested for freedom from transmission of current to the surrounding tissues and then kept in this position throughout the remainder of the experiment. After several viscerosensory reflex responses were obtained, ablation of any desired portion of the sympathetic nervous system was performed and the effects noted. If, as a result of the ablation, the sensory effects were abolished, the central end of the site of section was then stimulated. By alternate and progressive stimulation, section and stimulation, the essential sensory pathways originating in the ovarian plexus were traced (Figs. 1 to 4).

In a total of 50 observations in which the sensory pathways were intact from the site of stimulation, there occurred an average rise in blood pressure of 13 mm. There was no noticeable effect on the heart rate. The respiratory effect was variable. In some instances there was an increase in depth without a corresponding increase in rate, while in others the opposite occurred. In only four cases was there a decrease in frequency of respiratory movements. In 29 observations an average increase in rate of 9 per minute was noted. In 17 instances no change in rate occurred, but in such cases the depth of respiration usually increased. In 7 no change in depth was noted. In 6 cases the respiratory change was characterized by an initial inspiratory spasm with the onset of stimulation.

RESULTS

I. *Peripheral Distribution of Sensory Components of the Ovarian Plexus.*—Fig. 1 illustrates the origin and peripheral distribution of the sensory fibers of the ovarian plexus, as revealed by the use of the procedures outlined above.

The ovarian arteries in the cat arise from the abdominal aorta slightly above the level of the fifth lumbar sympathetic ganglion. The vessels course downward and laterally to enter a short fold of peritoneum which anchors the ovary and tube to the side wall of the pelvis. The ovarian vessels enter this suspensory ligament and after a short distance branch peripherally to supply the ovary and tube.

At the outset of the experiments it was deemed necessary to find the point of greatest sensitivity in the ovarian plexus. This was found to be a point on the ovarian vessels within the suspensory ligament just proximal to their point of bifurcation into their peripheral branches (Fig. 1, *4*, *a*, *b*).

Various spots within the broad ligament in the vicinity of the ovarian vessels adjacent to this site were stimulated but no sensory response was elicited. However, when the electrode was placed on the ovarian vessels and a stimulus applied, there resulted marked reflex responses on the blood pressure and respiration. The electrodes

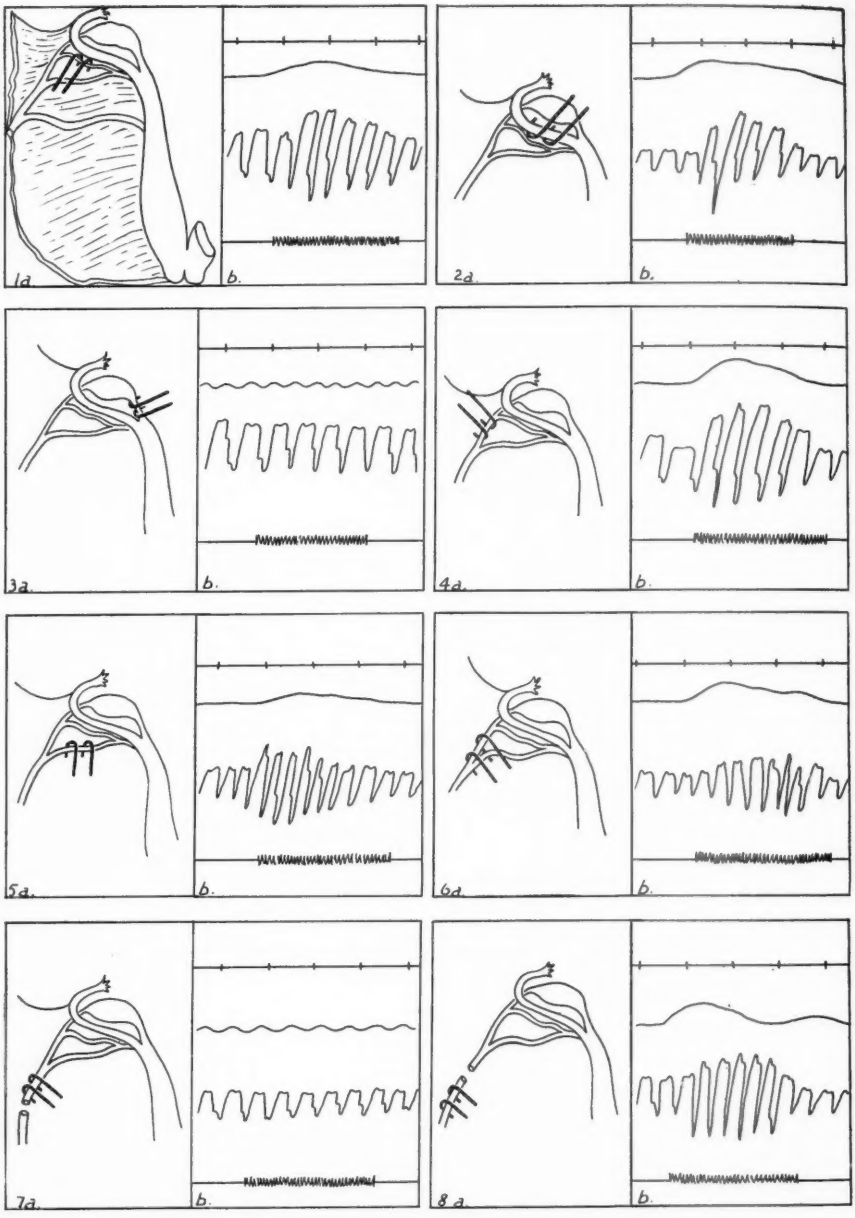

Fig. 1.—Figures showing the peripheral distribution of sensory components of the ovarian plexus. *1*, *2*, *4*, *5* and *6* show sites from which sensory components arise. *3* shows lack of sensory fibers in the ovarian ligament connecting the uterus and ovary. 7 and 8 show that the sensory components noted above all pass along the ovarian artery. Key to this and other figures: *a*, Schematic figures of experimental procedures and sites of stimulation. *b*, Sensory reflex effects on blood pressure and respiratory movements. Top line, five-second intervals; second line, blood pressure; third line, respiratory movements; fourth line, electrical stimulation and zero level for blood pressure. See text for discussion.

were then moved peripherally along the branches of the ovarian vessels with the production of typical reflex effects (Fig. 1, *3a* to *6b*).

The ovarian ligament which anchors the ovary to the uterus was found to be devoid of sensory fibers as indicated by failure to obtain reflex effects on electrical stimulation (Fig. 1, *3*, *a*, *b*). Stimulation of

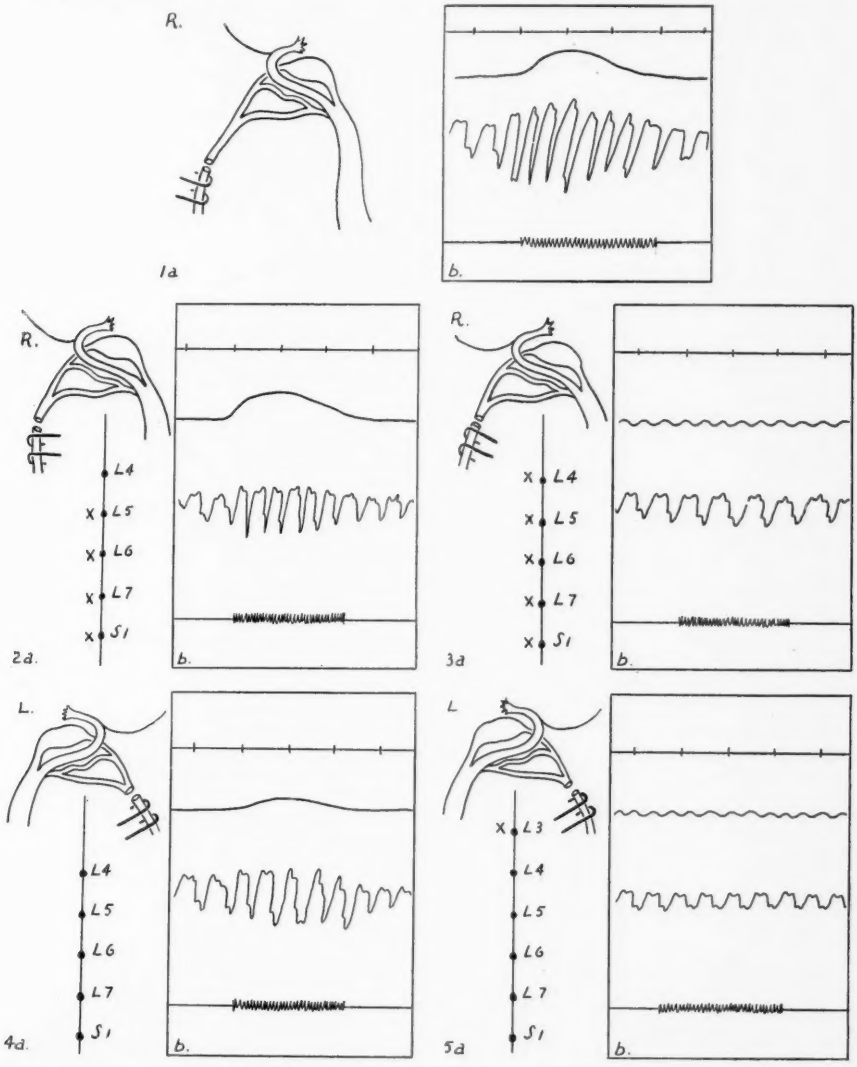

Fig. 2.—Figures showing sensory pathways of ovarian plexus to the main ganglionated sympathetic trunk. *1a*, *b*, normal responses with stimulation of main sensory pathway from ovarian plexus (see Fig. 1). *2a*, *persistence* of sensory effects after exclusion of ganglia, L^5-S^1, inclusive. *3a*, *b*, *absence* of sensory effects after excision of ganglion L^4. Contralateral plexus, same animal; *4a*, *b*, presence of sensory effects with stimulation of main pathways of this ovarian plexus. *5a*, *b*, *absence* of sensory effects after excision of ganglion L^3 alone. See text for discussion.

the fallopian tube, on the other hand, produced typical reflex responses on blood pressure and respiration (Fig. 1, *2*, *a*, *b*).

We conclude from this series of experiments that the sensory fibers of the ovarian plexus issue from the ovary and tube and intimately follow the course of the ovarian vessels. When the ovarian vessels are severed, stimulation of the distal cut end produces no reflex response, but stimulation of the central end immediately causes a rise in the blood pressure and an increase in the rate and depth of respiration (Fig. 1, *7a*, to *8b*).

II. *Central Sensory Pathways of the Ovarian Plexus.*—These were determined by stimulation peripherally about the ovarian vessels after systematically destroying the sympathetic trunk at various levels. Fig. 2 illustrates the effect on reflex activity after removal of successive sympathetic ganglia beginning at the first sacral ganglion and proceeding upward through the lumbar chain.

These observations show that not until the fourth lumbar sympathetic ganglion is removed are the sensory responses from the ovarian plexus affected or abolished. Thus the sensory components of the ovarian plexus enter the main sympathetic trunk above the level of the fifth lumbar ganglion (Fig. 2, *3*, *a*, *b*).

To prove that the animal was still responsive to stimulation and that the loss of reflex effects was not attributable to the progressive ganglionectomies from S^1 to L_4 a shielded electrode was placed on the contralateral ovarian vessels. Stimulation of this intact ovarian plexus evoked an immediate reflex elevation in blood pressure and an increase in respiratory movements (Fig. 2, *4*, *a*, *b*). Accordingly, the lowest essential sympathetic ganglion which receives sensory fibers from the ovarian plexus is L_4. When the third lumbar ganglion on this side was removed, however, the remainder of the trunk, above and below including L_4 being intact, the vascular and respiratory reflex effects were absent (Fig. 2, *5*, *a*, *b*). This shows that the sensory fibers enter the fourth lumbar ganglion and pass upward through the third lumbar sympathetic ganglion to reach higher levels. This is true because if the fibers were to enter the fourth lumbar ganglion and then pass through the rami communicantes to enter the spinal cord at that level, transection of the third lumbar ganglion should not abolish the reflex responses.

Fig. 3 illustrates a series of experiments to show that the sensory fibers do not enter the spinal cord below the level of the second lumbar ganglion by way of the rami communicantes. Successive removal of the rami up to and including those at the level of the third lumbar ganglion failed to abolish reflex activity. However, transection of the main sympathetic trunk above the third lumbar ganglion then immediately caused cessation of reflex changes in blood pressure and respiratory movements (Fig. 3, *1a* to *6b*).

This group of experiments proves that the sensory fibers from the ovarian plexus travel along the ovarian vessels and enter the fourth

lumbar sympathetic ganglion. These fibers then run upward through the main sympathetic trunk beyond the third lumbar ganglion without passing to the spinal cord through the rami communicantes at these levels.

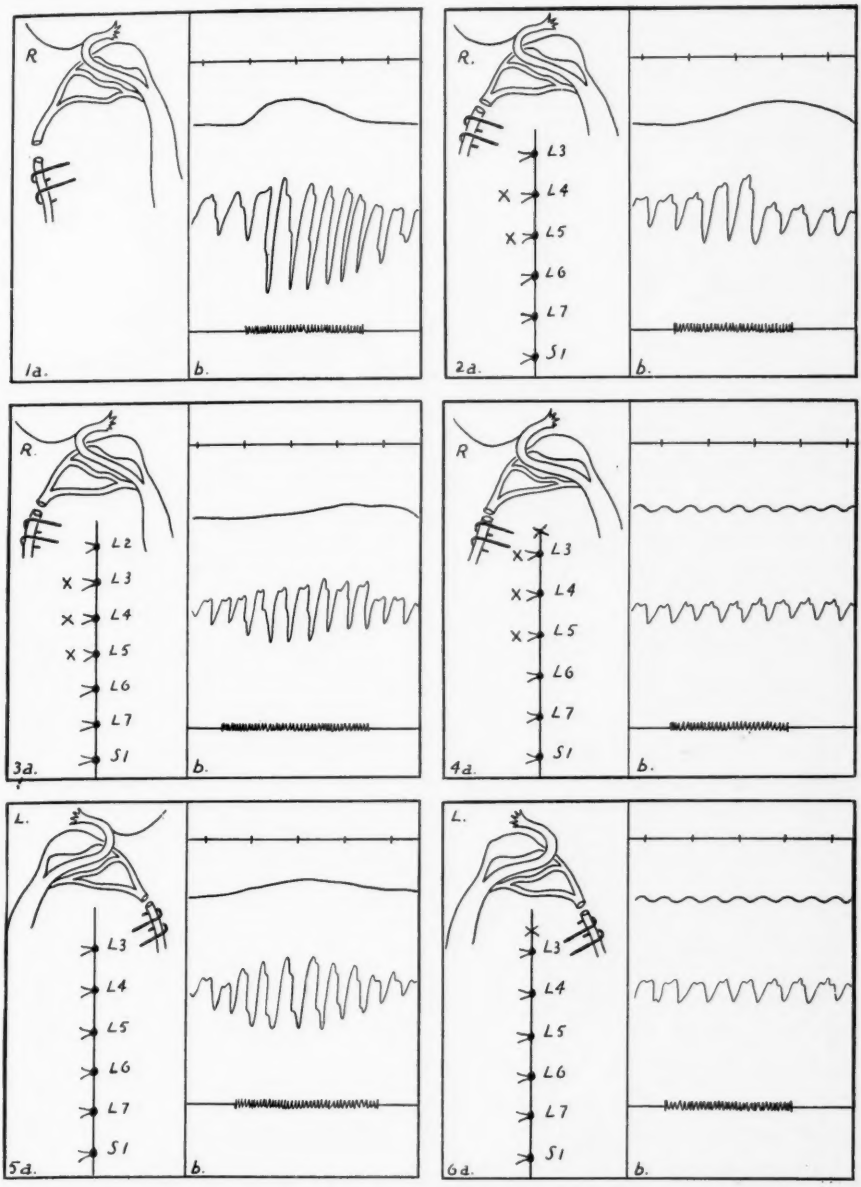

Fig. 3.—Figures showing that sensory fibers of ovarian plexus pass in the ganglionated chain to levels above L^3. *1a, b,* sensory effects of stimulating main pathway of ovarian plexus; *2a, b,* and *3a, b,* persistence of sensory effects after ablation of rami communicantes of L^3, L^4, L^5 inclusive; *4a, b,* absence of sensory effects following section of ganglionated chain above L^3. Contralateral plexus, same animal; *5a, b,* usual sensory effects from stimulation of main pathways of ovarian plexus; *6a, b,* absence of sensory effects after section of ganglionated chain between L^2 and L^3, with all ganglia and rami communicantes intact. See text for discussion.

III. *Nonessentiality of the Superior Hypogastric Plexus.*—The sensory fibers from the uterus probably travel by way of the superior hypogastric plexus [Kuntz (1934) and preliminary observations of our own]. It should be a matter of interest and of some practical importance to determine whether or not the sensory fibers from the ovaries and tubes also pass through the superior hypogastric plexus, in view of the advocacy on the part of some investigators [Fontaine and Herrmann (1932), Elaut (1932), A. A. Davis (1934), Leriche (1927), Adson (1936), and others] for hypogastric nerve resection for pelvic pain.

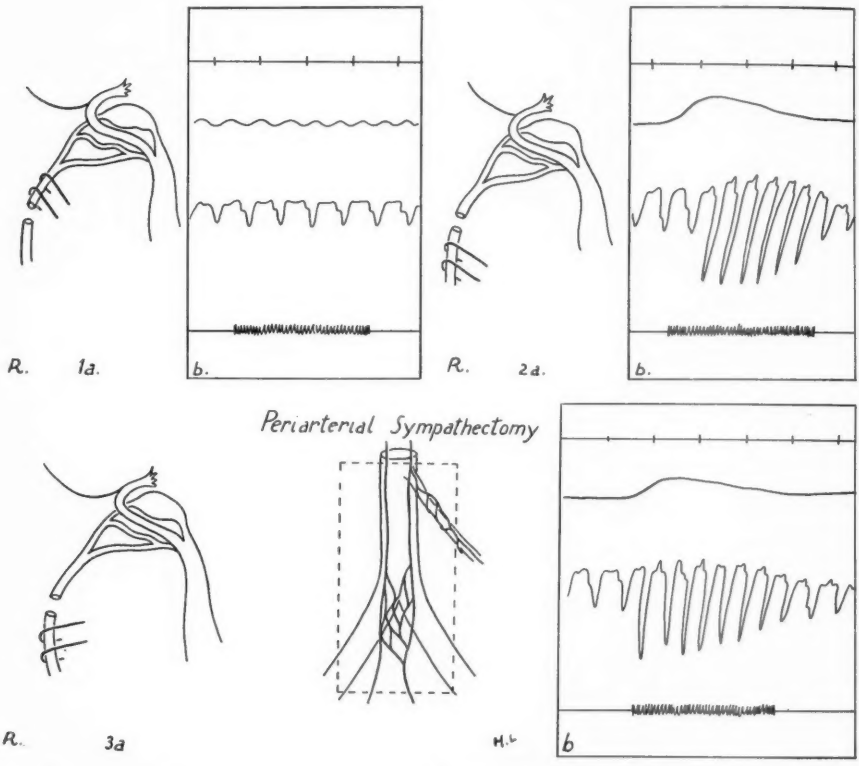

Fig. 4.—Figures showing the absence of sensory components of the ovarian plexus in the hypogastric plexus. *1a, b,* absence of sensory effects upon stimulation of peripheral end of cut ovarian plexus, when all tissues from this point downward, to uterus, mesometrium and hypogastric plexus are intact. *2a, b,* usual sensory effects upon stimulation of central end of cut ovarian plexus; *3a, b,* persistence of sensory effects after complete periarterial sympathectomy. Ablation of ganglion L^4 alone subsequently abolished the sensory effects. See text for discussion.

Fig. 3 illustrates a group of experiments which show that sensory fibers from the ovarian plexus do not go by way of the superior hypogastric plexus. In the first place stimulation of the peripheral cut end of the ovarian plexus does not produce any reflex responses on blood pressure and respiratory movements (Fig. 4, *1, a, b*), even though the tissues are intact from the cut ovarian artery downward. Conceivably, if the afferent fibers pass downward within the broad ligament

to merge with the afferent components of the uterine plexus, stimulation of the peripheral cut end of the ovarian plexus should cause reflex rises in the blood pressure and respiratory movements. This is not the case, however.

To demonstrate this point still further, a shielded electrode was placed on the central end of the cut ovarian vessels. Then the lower portion of the abdominal aorta, the inferior mesenteric artery, the common iliac arteries, and the interiliac zone were completely denuded

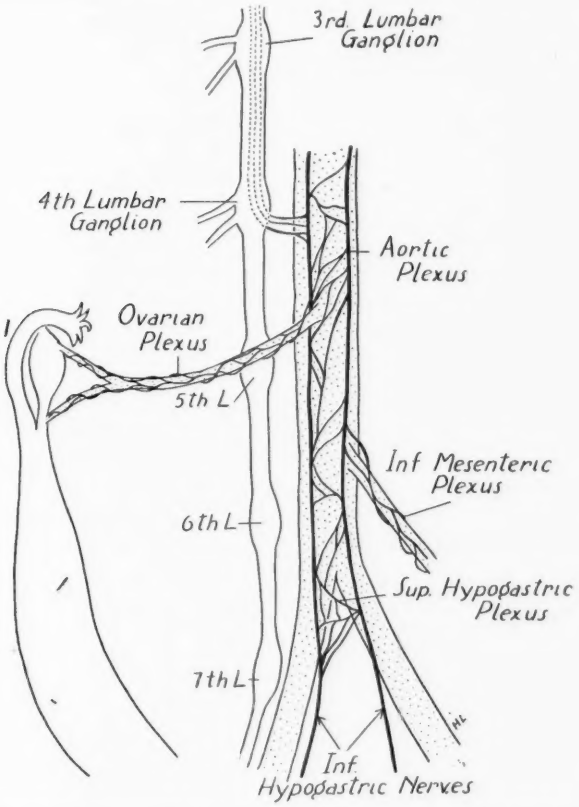

Fig. 5.—Schematic representation of the origin, course and distribution of the sensory components of the ovarian plexus. The sensory fibers enter the ganglionated chain at L^4, pass through L^3 to L^2. None enter the spinal cord below L^2, and none pass centrally through the inferior or superior hypogastric plexus.

leaving the entire sympathetic trunk intact. After such complete periarterial sympathectomy, faradic stimulation was applied through the shielded electrode. This immediately elicited a marked rise in blood pressure and respiratory movements (Fig. 4, *3*, *a*, *b*).

These observations force us to the conclusion, therefore, that sensory fibers from the ovarian plexus do not pass through the superior hypogastric plexus but reach the central nervous system solely by follow-

ing the course of the ovarian vessels and entering the fourth lumbar sympathetic ganglion from which point they ascend to reach higher levels. It may be mentioned that, by the same token, they do not pass through the inferior mesenteric plexus or the lower portion of the aortic plexus.

DISCUSSION

That the afferent fibers from the ovary course along the ovarian artery has been suspected for some time. Kuntz (1934) states that the afferent components from the ovary travel along the ovarian plexus to reach the cord at the level of the tenth thoracic segment. Those of the fallopian tube course through the superior hypogastric plexus

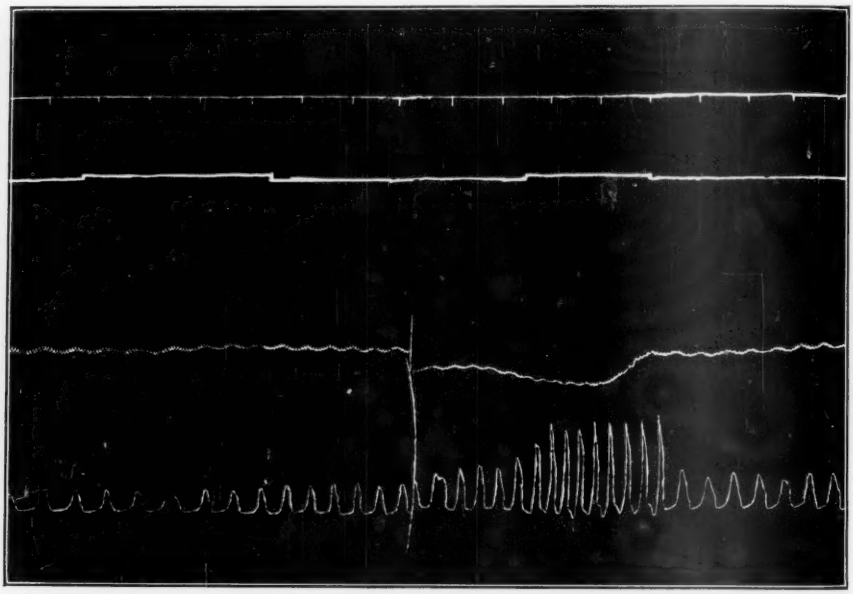

Fig. 6.—Kymographic recording showing increase in depth of respirations and elevation of blood pressure upon stimulation of the intact ovarian plexus. The record on the right shows the absence of such reflex effects after section of the ovarian plexus. The drawings for Figs. 1 to 3 were made from similar recordings.

to reach the cord at the level of the first lumbar to eleventh thoracic segments. Langley and Anderson (1895) considered the fibers of the ovarian plexus as relays from the inferior mesenteric ganglia. Dahl (1916) stated that the nerves to the ovary form a definite plexus arrangement following the course of the ovarian vessels.

However, we are not aware of any substantiating evidence in the literature pointing to the level that the ovarian afferents enter the main sympathetic trunk. The present group of experiments show that the sensory fibers run in close approximation to the ovarian vessels and enter the main sympathetic trunk through the fourth lumbar

ganglion. The afferents then travel upward through the main sympathetic trunk to enter the spinal cord at some level above the third lumbar ganglion (Fig. 5).

We have been unable to show the point of entrance of these sensory fibers into the spinal cord because of technical difficulties involved in tracing the fibers through the diaphragm and into the chest without affecting the sensory responses. To determine this it will be necessary to conduct chronic experiments in which the ganglionated chain is first cut at suitable points in the chest in a preliminary operation which is followed by acute experiments of the type reported in the present study.

CONCLUSIONS

1. A method has been described by which the course and distribution of the sensory components of the pelvic sympathetic nerves may be studied.

2. Applied to the ovarian plexus this study shows that:

a. The sensory fibers originate in close relationship to the various peripheral branches of the ovarian artery.

b. The afferents follow closely the course of the ovarian artery.

c. They enter the fourth lumbar sympathetic ganglion and then traverse upward through the third lumbar ganglion to reach a higher level in the main sympathetic trunk.

d. The ovarian afferent components have no connections by way of the superior hypogastric plexus, nor do they, by the same token, traverse the inferior mesenteric ganglia or the lower aortic plexus.

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The author reports a case of nevus telangiectaticus which did not appear until the third month of the first pregnancy. It became increasingly more conspicuous and disappeared after the puerperium. It returned, however, in a second pregnancy and disappeared again soon after the baby was born. The author does not believe that the nevus arose during the first pregnancy but that it was present in a latent form and became manifest for the first time during pregnancy.

J. P. GREENHILL.

ECLAMPSIA AND ITS SEQUELAE

A Clinical and Follow-up Study of All Cases at Boston Lying-In Hospital Over a Twenty-Year Period

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INVESTIGATION of the cardiovascular and renal sequelae of pregnancy toxemias, ideally should include only cases in which three factors are known.

First, the past histories of the patients studied, as these concern hypertensive disease and nephritis, should be definitely known. This is obvious since the common subsequent findings are hypertension and albuminuria.

Second, the family histories for hypertensive disease should be known. It is possible that patients destined to become hypertensives are more susceptible to pregnancy toxemias, including eclampsia, whether or not they have clinical hypertension at the time. Indeed, the stocky, florid patient who seems to be peculiarly susceptible to eclampsia is of essentially the same body type as the common hypertensive irrespective of pregnancy.

The importance of latent as well as of demonstrable hypertensive disease as contributory and complicating factors in many pregnancy toxemias has been pointed out by Corwin and Herrick[1] who stated, "That childbearing can reveal essential hypertension, when that disorder is latent, and aggravate it when it is actively present, is a fact that should be recognized by every obstetrician and every internist." However, even in their meticulous clinical and follow-up study of toxemic patients, prepregnancy data on blood pressure and urine were lacking in most cases.

Third, the duration and severity of the toxemia as indicated by the duration and severity of the hypertension and albuminuria should be known. On the basis of the established vasospastic mechanism of preeclampsia and eclampsia as presented by Irving,[2] it is reasonable to infer that prolonged and severe spasm, as indicated by marked hypertension and heavy albuminuria of considerable duration, should produce more permanent structural damage than transient or mild toxemia. Eclampsia shows the most marked vasospasm of the acute toxemias of pregnancy, and in this sense should result in more vascular damage than preeclampsia. However, the preceding toxemia, in cases of eclampsia, is not infrequently of brief duration. Whether a brief severe preeclampsia culminating in convulsions produces as much permanent vascular

damage as a prolonged nonconvulsive toxemia with marked hypertension and heavy albuminuria for many weeks would seem to be doubtful.

Such information as there is from follow-up studies would tend to indicate that subsequent vascular and renal damage is correlated more closely with the duration of the toxemia than with the maximum severity which may be reached momentarily during the course of the disease. Thus, Sym[3] found that the longer the course of the "albuminuria" of pregnancy, the more likely the patient is to sequelae. He also found that one-fourth of the pregnancies which followed eclampsia were complicated by toxemia, whereas one-half of those following "albuminuria" of pregnancy were so involved.

Study of the vascular pathology in fatal cases of preeclampsia and eclampsia, as seen for example in the liver, kidney, adrenal, and spleen, gives clear indication of the marked narrowing of the arterioles, leading to ischemia, hemorrhage, and not infrequently to thrombosis. In such an organ as the kidney, thrombosis of the afferent glomerular arteriole would inevitably lead to destruction of the glomerular and tubular unit involved. Similarly, prolonged ischemia, as a result of arteriolar spasm, might conceivably lead to permanent damage of the functional unit supplied. This should be particularly true of organs supplied by the terminal type of circulation.

Among the cases of toxemia and eclampsia which occur in obstetric clinics, it is difficult to secure a significant number for follow-up study in which all three of the above-mentioned desiderata are available. In most instances, eclampsia results from ignorance and neglect on the part of the patient or her medical attendant. Consequently, patients who are treated in the obstetric clinics are usually first observed after convulsions have occurred, when the patient is in no condition to give an accurate medical history. Detailed histories taken subsequent to recovery reveal that a large proportion of these patients can give no positive information concerning the blood pressure and urine findings prior to or early in the involved pregnancy. Some have medical records of known hypertensive disease or nephritis, and a few more have records from insurance examination within a year or two of the eclamptic episode. In most cases, however, there is no reliable information as regards the blood pressure and urine findings prior to the eclamptic pregnancy. For this reason, it is often impossible, particularly in cases of eclampsia, to determine with certainty whether it has been superimposed upon preexisting vascular or renal disease. This is a very sad state of affairs, both from the practical and academic standpoint. Undoubtedly the immediate prognosis of eclampsia is altered considerably by preceding hypertension and nephritis. Furthermore, the incidence of hypertension or albuminuria which follows eclampsia cannot properly be related to it unless past medical histories are known.

The impression is common that eclampsia is rare in pregnant hypertensives and nephritics. We believe that eclampsia is infrequent in *known* hypertensives and nephritics because they are carefully watched and appropriately treated. For the same reason, eclampsia is rare in previously normal patients who develop preeclampsia under competent observation. It is our opinion that eclampsia is much more frequent among neglected hypertensives and nephritics than among neglected patients previously normal. Our autopsy material from fatal cases supports this opinion. Careful study of the pathology of 38 fatal cases of eclampsia by Acosta-Sison[4] revealed evidence of chronic nephritis in 38.4 per cent. She included as nephritics, patients with both primarily parenchymatous and interstitial (vascular) kidney lesions.

We have made a study of all the eclamptic patients treated at the Boston Lying-In Hospital during the twenty-year period from 1915 through 1934. All patients included in the group had at least one convulsion. Only two fatal cases in which convulsions occurred have been excluded. One of these patients had a brain tumor, verified at autopsy, and the other had a brain abscess, also verified at autopsy. On the other hand, a number of nonfatal convulsive cases have been excluded because the convulsions were atypical, the blood pressure and urine findings were minimal, and past or subsequent histories reveal grand mal.

Statistical data for the whole group are briefly presented. In addition, for purposes of analysis and follow-up study, the patients have been divided into three groups with respect to their histories prior to the eclampsia. *Group I* includes only those patients without history of glomerular nephritis, whom we know from our own records to have had normal urine and blood pressure on more than one occasion during pregnancy prior to the eclampsia. *Group II* is made up of those patients who are known to have had hypertensive disease or chronic nephritis prior to the eclamptic pregnancy. *Group III* consists of those patients whose past histories as regards hypertension and nephritis are unknown. These patients were all admitted as emergencies, after the occurrence of convulsions, without records of blood pressure or urine prior to or during the involved pregnancy.

The patients have all been grouped upon objective evidence available at the time of the eclampsia. Excepting several instances in which the vascular system or kidneys at autopsy showed conclusive evidence of chronic disease independent of the eclampsia, we have not changed patients from the originally unknown into the known positive group; neither have we changed patients from the originally unknown into the known negative past history group on the basis of normal blood pressure and normal renal function tests subsequent to the eclampsia. This latter procedure, in one sense, would be justifiable, but it would make

an apparent decrease in the real incidence of hypertension and nephritis in the patients who were known to have been normal prior to the eclampsia.

This grouping of the patients is of some interest in relation to the immediate prognosis of the eclampsia, but it is vital in evaluating the cause and effect relationship between the eclampsia and subsequent cardiovascular and renal disease.

INCIDENCE

During the twenty-year period studied, eclampsia was treated 173 times in 168 patients. There were five instances of recurrent eclampsia. During the same period 55,426 patients were delivered in the hospital and out-patient services. The gross incidence of eclampsia was once for each 320 deliveries. However, 127 of the eclamptic patients were transferred to the clinic as emergencies by private physicians, and other hospitals, after convulsions had occurred. Of the patients who were registered in the clinic and who had made one or more visits, 46 developed eclampsia. Thus, the incidence of eclampsia among patients under care of the clinic was approximately one in 1,200 deliveries. Many of the clinic patients in whom eclampsia developed had failed to meet appointments or refused hospital admission earlier in pregnancy. Indeed, the more carefully cases of so-called "fulminating eclampsia" are studied, the less frequent such cases appear to be. It thus appears that with reasonable cooperation of the patient during the prenatal period, careful check of weight gain, edema, urine, blood pressure, and symptoms, combined with timely treatment and interference, would make it possible, practically, to eliminate eclampsia.

The seasonal incidence of our cases is not remarkable. There were 38 cases from January through March, 49 cases from April through June, 47 cases from July through September, and 39 cases from October through December. Thus, the incidence was slightly greater during the warm season.

MORTALITY—INFLUENCE OF SOURCE OF PATIENT, TYPE OF ECLAMPSIA, AGE, AND PARITY

The mortality figures are offered with no corrections. In the deaths are included patients who died within a few minutes after admission as well as several patients who died of sepsis, weeks after delivery. Total deaths among the 173 cases were 46 (26.6 per cent). Of the fatal cases, 39 occurred among the 127 emergency cases (30.7 per cent), and of the 46 clinic cases, seven died (15.2 per cent). Thus, the emergency patients, who contributed 73.4 per cent of the eclampsia, accounted for 85 per cent of the fatalities. We suspect that the high death rate among the emergency patients may be explained in large part by two circumstances. First, many of these patients were moved over considerable

distances after the occurrence of convulsions. A number of them were transferred from their homes first to another hospital and then to this clinic. Second, the incidence of eclampsia superimposed upon preexisting hypertension and nephritis was much higher in the emergency group. Among the clinic cases with hypertension and nephritis, eclampsia was largely prevented by a combination of frequent observations, medical regime, and termination of the pregnancy upon indication.

The eclampsia was severe according to the classification of Eden in 118, or 68.2 per cent of the patients. Of the severe cases, 43 died (36.4 per cent). Of the 55 mild cases, three ended fatally (5.5 per cent).

In 101 cases the convulsions began antepartum. Fatalities in this group were 34 (33.6 per cent). Three of the 25 patients with intrapartum eclampsia died (12 per cent), and among 45 postpartum cases there were nine deaths (20 per cent).

There were 96 patients less than thirty years of age of whom 18 died (18.7 per cent). Of the remaining 77 patients over thirty years, 28 ended fatally (36.3 per cent).

Primiparas and multiparas were about equal in number, there being 85 of the former with 18 deaths (21.2 per cent) and 88 of the latter with 28 deaths (31.8 per cent). The higher mortality among the multiparas and older patients might reasonably be correlated with the greater incidence of preceding hypertensive disease and nephritis in these groups.

Division of the cases into three groups according to their histories as regards hypertensive disease and nephritis preceding the eclampsia results in marked differences in the mortality rates. The groups are made up as previously described.

Group I: (Negative past history.) There were 39 patients in this group with four deaths (10.3 per cent).

Group II: (Positive past history.) Of the 13 known hypertensives and nephritic patients who developed eclampsia, eight died (61.5 per cent).

Group III: (Unknown past history.) Of the 121 patients in this group, 34 died (28.1 per cent).

As might be anticipated, the mortality was highest in the small group with preceding hypertensive disease or nephritis, intermediate in the patients with unknown past history and lowest in the group with eclampsia known to have been uncomplicated by preceding vascular or renal disease.

TREATMENT

Significant discussion of these cases as regards method of treatment and mortality rate is impossible because the series goes back to the time when immediate accouchement forcé, bagging, and cesarean section were in vogue. The number of patients treated by modern and more conservative methods is too small to be of significance. Suffice it to state

that of 24 patients delivered by immediate abdominal or vaginal hysterotomy, 12 died (50 per cent). It would be hazardous to attribute all these deaths to the cesarean section per se. Doubtless, ill-advised choice of anesthesia and coincident medical treatment played important contributory rôles.

COMPLICATIONS IN FATAL CASES

Of the 46 fatal cases, death was preceded by acute pulmonary edema in 26, uremia in 4, shock and hemorrhage in 3, and cerebral hemorrhage in 2. In five instances the patient "faded out" without ascertainable cause. The following complications were observed in single instances, severe diabetes, lobar pneumonia, pneumonia with "hepatic insufficiency," sepsis with empyema, and sepsis with rheumatic heart disease.

The relatively high incidence of acute pulmonary edema in the fatal cases (56 per cent) is of interest.* It suggests that the immediate cause of death in eclampsia is frequently left ventricular failure. This opinion is supported by the occasional occurrence of severe cardiac asthma with acute pulmonary edema in cases of severe preeclampsia with or without preceding vascular, cardiac, or renal disease (Teel, Reid and Hertig[5]).

FETAL MORTALITY

Records are available on 171 of the babies of these patients. The gross fetal mortality was 51 per cent. The eclampsia occurred before the thirty-fourth week of gestation in 27.2 per cent of the cases, which accounts in part for the high fetal mortality. The fates of the babies are summarized with respect to birth weights in Table I.

TABLE I. FETAL MORTALITY IN 171 BABIES OF ECLAMPTIC MOTHERS

WEIGHT	LIVED	NEONATAL DEATHS	STILLBIRTHS	TOTAL
Under 5 pounds	27	14	40	81
5 to 6 pounds	13	5	12	30
Over 6 pounds	44	2	14	60
Total	84	21	66	171

FOLLOW-UP STUDY

We have made every effort to learn the subsequent fate of each patient who survived eclampsia. In locating the patients, inquiries have been made of relatives, friends, and family physicians. City directories, police lists, and voting lists have been used. The Community Health Nursing Association has located several patients, and a number have been traced through the In- and Out-Patient Departments of the large community hospitals. Finally, the name of each patient who has not

*We have included only those patients with signs of acute pulmonary edema for several hours before death. We believe that we have not confused it with agonal rhonchi.

been located has been sought among the death certificates for the state of Massachusetts for each year subsequent to our last record.

There have been eight deaths among the 127 patients who survived eclampsia:

M. D. was readmitted to this hospital as an eclamptic emergency at the age of twenty-two, three years after her first eclampsia, with recurrent antepartum eclampsia complicated by severe abruptio placentae. She died of uremia with suppression of urine, seven days postpartum. At the time of the first eclampsia the past history had been unknown. Autopsy was refused.

R. L. was readmitted to this hospital as an eclamptic emergency at the age of thirty-nine, eight years after the first seizure of eclampsia. She died four days postpartum of recurrent antepartum eclampsia. The autopsy revealed lobar pneumonia and rheumatic heart disease with mitral stenosis and mitral vegetations. The kidneys were of normal size, and the capsule stripped readily, leaving a few small surface scars. The cortices were essentially normal, and the kidneys were otherwise not remarkable.

A. M. was admitted to another hospital at the age of forty, eighteen months after her eclampsia at this clinic. She was suffering from another severe toxemia of pregnancy (possibly eclampsia) from which she died. No autopsy was performed.

K. O. was admitted to another hospital thirteen months after her eclampsia, at the age of forty-six. On admission she was in coma with a complete right hemiplegia and signs of congestive failure. The blood pressure was 200 systolic, 140 diastolic, but the catheter urine showed no albumin. She died four days after admission, and the clinical diagnosis was hypertension with cerebral hemorrhage. This patient had been treated for hypertension before the eclamptic pregnancy. No autopsy was performed.

H. C. was admitted to a psychiatric institution at the age of forty-five, eighteen years after her eclampsia, with complaints of stupor, unresponsiveness, facial palsy, and incontinence of urine. There was a history of hypertension for more than a year, with milder but similar cerebral symptoms. The blood pressure was 230 systolic, 130 diastolic, and the heart was enlarged. The urine concentrated to 1.031 and showed no albumin. The diagnosis was cerebral arteriosclerosis and hypertension. The patient gradually failed and died. No autopsy was performed. There was no record of the blood pressure of this patient prior to her eclampsia.

G. K. died at home at the age of forty-one, five years after her eclampsia. The diagnosis of the attending physician was lobar pneumonia and chronic nephritis. The blood pressure and urine findings were unknown prior to the eclamptic pregnancy, but nine months after delivery there was moderate elevation of the blood pressure, and the urine contained a slight trace of albumin in a voided specimen. She probably had hypertension at the time of her death, and may have been a nephritic.

M. C. died at home at the age of forty-nine, seven years after her eclampsia. The diagnosis of the attending physician was mitral stenosis with cardiac decompensation. There was no autopsy, and the patient may well have died of hypertensive heart disease. At least, there was no evidence of mitral stenosis at the time of her eclampsia. Whether this patient had hypertension or albuminuria prior to the eclampsia is also unknown.

F. S. died at the age of thirty-nine, five years after her eclampsia, from carcinoma of the cervix. There was no hypertension at the time of her death.

Thus, of the eight patients who have died subsequent to their recoveries from eclampsia, three succumbed to recurrent pregnancy toxemias, of which two were recurrent eclampsia. Of the remaining five,

three are known to have had hypertensive disease and one may have had nephritis.[1] None of the hypertensive deaths occurred in patients whose histories were known to be negative and whose blood pressures and urine were known to have been normal prior to the eclampsia.

At present, the remaining 119 survivors of eclampsia are presumably alive. We have failed to communicate with 32 of them, although none has died in any of the larger community hospitals, and death certificates have not been filed for any of them in the state of Massachusetts, subsequent to our last record. In seven instances we have corresponded with patients whom we were unable to examine.

The remaining 80 patients have all been examined, one or more times, at intervals of from more than one year to twenty-one years. The average interval between the eclampsia and the last examination is 7.6 years. Blood pressure readings and urine examinations have been secured upon all patients. In more than 50 of them complete physical examinations with seven-foot heart plate, electrocardiogram, and urea clearance test have been made. The cardiology of these patients will be reported elsewhere.

SUBSEQUENT HYPERTENSION AND ALBUMINURIA

Because of the fact that nearly all of the clinic patients who developed eclampsia were known to have had blood pressures below 140 systolic and urine free of albumin earlier in pregnancy, and since we believe that this was not the case with a considerable proportion of the emergency patients, we have separated them in the follow-up study. Notwithstanding the small groups, the separation seems to be justified.

Of the 80 patients examined, the blood pressure was above 150 in 22 (27.5 per cent). There were 31 clinic patients in the group, of whom only three had systolic pressures over 150 (9.7 per cent). In each of the three instances the hypertension was disclosed at examination more than 15

TABLE II. BLOOD PRESSURE AT FOLLOW-UP EXAMINATION IN 80 PATIENTS FROM ONE TO TWENTY-ONE YEARS FOLLOWING ECLAMPSIA

Average interval after the eclampsia is 7.6 years. The patients are arranged in two groups depending upon whether they attended the prenatal clinic or were admitted as emergencies.

YEARS F. U.	1-4 YR.		5-9 YR.		10 YR.		TOTAL		GRAND TOTAL
SYSTOLIC BLOOD PRESSURE	EMERGENCY	CLINIC	EMERGENCY	CLINIC	EMERGENCY	CLINIC	EMERGENCY	CLINIC	
Less than 140	6	7	8	7	9	7	23	21	44
140-149	3	4	0	3	4	0	7	7	14
150-174	1	0	1	0	6	1	8	1	9
175-199	1	0	1	0	1	0	3	0	3
200-	3	0	3	0	2	2	8	2	10
Total	14	11	13	10	22	10	49	31	80

years after the eclampsia, without interval follow-up, so that it is impossible to determine when the hypertension developed with relation to the eclampsia. Of the 49 emergency patients examined at follow-up, 19 (38.8 per cent) showed systolic pressures over 150. The data on the subsequent blood pressures are summarized in Table II.

Only seven of the 80 patients showed albuminuria at follow-up examination (8.7 per cent). None of the patients who had attended the clinic showed albuminuria at examination more than one year postpartum.

The 80 followed patients fell into the three above-defined groups with reference to history of hypertension or nephritis prior to the eclamptic pregnancy as follows:

Group I: (Known normal before eclamptic pregnancy.) In this group there were 29 who were followed. The systolic pressure was above 150 in three of them (10.3 per cent). These three patients were all more than fifteen years postpartum. There were no instances of albuminuria in this group.

Group II: (Known hypertensives or nephritics before eclamptic pregnancy.) There were only four patients in this group. All of them had systolic pressures above 175.

Group III: (Unknown histories for hypertension or nephritis prior to the eclamptic pregnancy.) There were 47 patients in this group of whom 15 had systolic pressures above 150 (31.9 per cent). All of the seven instances in which albuminuria was found were in this group.

The data for the blood pressure values in the patients grouped upon past history for hypertension or nephritis at the time of the eclampsia are summarized in Table III.

TABLE III. FOLLOW-UP BLOOD PRESSURES* FROM ONE TO TWENTY-ONE YEARS IN 80 PATIENTS WHO SURVIVED ECLAMPSIA

The patients are arranged in three groups on the basis of positive, negative, or unknown history for hypertension or nephritis at the time of the eclampsia.

	KNOWN NORMAL			UNKNOWN HISTORY			KNOWN NEPHRITIC OR HYPERTENSIVE			TOTAL			GRAND TOTAL
SYSTOLIC BLOOD PRESSURE	1-4 YR.	5-9 YR.	10+ YR.	1-4 YR.	5-9 YR.	10+ YR.	1-4 YR.	5-9 YR.	10+ YR.	1-4 YR.	5-9 YR.	10+ YR.	1-21 YR.
To 139	6	7	7	7	8	9	0	0	0	13	15	16	44
140-149	4	2	0	3	1	4	0	0	0	7	3	4	14
150-174	0	0	1	1	1	6	0	0	0	1	1	7	9
175-199	0	0	0	0	0	1	1	1	0	1	1	1	3
200-	0	0	2	3	1	2	0	2	0	3	3	4	10
Total	10	9	10	14	11	22	1	3	0	25	23	32	80

*The average follow-up period is 7.6 years.

UREA CLEARANCE TEST

In 50 patients the urea clearance test was done at follow-up examination. The results are shown in Table IV.

It will be seen that of 23 patients known to have been free of hypertension and nephritis prior to the eclampsia, the urea clearance test

showed values above 60 per cent in all cases. The single urea clearance below 50 per cent (28 per cent clearance) was obtained from a patient with known hypertension prior to the eclamptic pregnancy. There is record of impaired renal function with marked hypertension and nitrogen retention in one patient who was treated subsequent to her eclampsia at another hospital. The past history of the patient was unknown at the time of the eclampsia, and we have been unable to follow her.

TABLE IV. THE UREA CLEARANCE TEST IN FOLLOW-UP STUDY OF 50 ECLAMPTICS

All tests were performed at intervals of from more than one to twenty-one years after the eclampsia. Average interval was six years.

UREA CLEARANCE VALUE (PER CENT)	UNDER 50	50-59	60-69	70-79	80-89	90-99	100+	TOTAL PATIENTS
Group I*	–	–	1	5	2	5	10	23
Group II*	1	–	–	–	1	–	–	2
Group III*	–	2	3	5	5	1	9	25
Total	1	2	4	10	8	6	19	50

*The patients are arranged in groups according to their past histories at the time of the eclampsia, as previously described.

Group I. Known negative past history for hypertension and nephritis.

Group II. Known to have had hypertension or nephritis, prior to the eclampsia.

Group III. History as regards hypertension and nephritis prior to the eclampsia is unknown.

The results of the urea clearance tests in this series of patients suggest that if "chronic nephritis" is a frequent sequel of eclampsia, it seldom progresses to the point of renal insufficiency.

SUBSEQUENT PREGNANCIES

There have been 100 pregnancies in 48 of the followed patients. Some degree of hypertension or albuminuria was shown in 31 of them. There were five instances of recurrent eclampsia.

Of 45 pregnancies which occurred in 20 patients who were known to have been free of hypertension and nephritis before the eclamptic pregnancy, 17 were complicated at some time during the pregnancy by systolic blood pressure of 140 or more, or albuminuria, or both. There was one instance of recurrent eclampsia in this group. It is interesting that this patient, who had eclampsia twice, subsequently had a baby without signs of toxemia. Of the 45 babies, 40 survived. One of the five fetal deaths was not associated with toxemia.

The more recent follow-up studies of eclamptic patients bring out two definite points. First, the incidence of hypertension in patients who have had eclampsia is significantly greater than in patients following normal pregnancy. Breakey[6] in an interesting study showed clearly that the incidence of hypertension was higher in a series of 132 women who had had eclampsia from one to twenty-one years before than in 218

control patients from the same clinic who were delivered without toxemia. The incidence of hypertension was greater in the eclamptic group irrespective of age. On the basis of systolic blood pressure of 140 or more, the incidence of hypertension was 42.5 per cent in the eclamptic group and 33.72 per cent in the controls. On the basis of 150 systolic, the figures were 26.5 per cent and 21.6 per cent, respectively. The studies of Corwin and Herrick,[1] Herrick and Tillman,[7] Nevermann,[8] Schultz,[9] Sym,[3] Peckham[10] and others show similar results. Second, chronic nephritis subsequent to eclampsia, in the sense of chronic glomerulonephritis, pyelonephritis, and significantly impaired renal function, is uncommon. To be sure, the incidence of subsequent "chronic nephritis" has been estimated as 25 per cent and more. Unfortunately, in many of the earlier studies "chronic nephritis" was confused with hypertension. Of definite chronic nephritis on the basis of clinical study and renal function tests, the incidence is not great. Nevermann found three cases among 60 studied eclamptics. Greenhill[11] found five cases in the follow-up study of 60 eclamptic patients. However, four of them had been known to have had nephritis prior to the eclampsia. Sym reports two cases of chronic nephritis among 74 post-eclamptic patients. It should be pointed out that in none of these studies is it positively stated whether all of the eclamptic patients followed were known to have been free of hypertension and nephritis before the eclampsia.

It is of interest that in our cases, both the immediate eclamptic mortality and the incidence of subsequent hypertension and albuminuria have been materially lower among patients who had attended the prenatal clinic prior to the eclampsia than among those who were admitted as emergencies. There are probably a number of reasons why this should be true.

As regards the immediate mortality, it would seem that at least three factors have been operative in explaining the lower death rate among the clinic patients. *First,* the latter received more prompt hospitalization, with a minimum of transportation and confusion, after convulsions occurred. *Second,* among the clinic patients the course of the hypertension and albuminuria prior to the eclampsia was relatively brief. On the other hand, the duration of the toxemia preceding convulsions was frequently prolonged in the emergency patients. A number were known, by their physicians, to have had marked hypertension and albuminuria for many weeks before the onset of convulsions. It would seem that prolonged exposure of the system to the injurious effects of severe toxemia, before the onset of convulsions, might well make such patients poorer risks. *Third,* and most important, among the clinic patients the eclampsia was rarely superimposed upon preexisting hypertension or nephritis. Eclampsia in the emergency patients was often complicated

by preexisting hypertension, and less commonly, by nephritis. There can be little doubt that hypertensive and nephritic patients who develop eclampsia do poorly. Objectively, they constitute the majority of the "severe" cases, according to the classification of Eden.

The mortality rates of these patients when divided into groups on the basis of reliable past history for hypertension and nephritis, prior to the eclampsia, tend to bear out the above contention. Thus, the mortality rate among the patients known to have been free of hypertension and nephritis, before the eclampsia, was 10.3 per cent. Of the known hypertensive and nephritic patients, who developed eclampsia, it was 61.5 per cent. The mortality in the remaining group, in which the past history was unknown, was intermediate (28.1 per cent).

In the follow-up study of these patients two observations deserve emphasis. First, by far the most common abnormal subsequent finding is hypertension (27.5 per cent). Albuminuria is much less frequent (8.75 per cent). The answer to the question whether this hypertension is primarily vascular or renal in origin is suggested by the renal function tests. Of 50 cases in which the urea clearance test was done, only one was definitely abnormal. This clearance was obtained from a patient known to have had hypertension prior to the eclampsia. She showed no clinical evidence of significantly impaired renal function, and unfortunately the test could not be repeated. Concentration tests and examination of the urine sediment in many cases failed to reveal evidence of significantly impaired renal function. Second, such symptoms as were found in patients at follow-up examination were largely referable to hypertensive disease, i.e., dyspnea, orthopnea, vertigo, paroxysmal dyspnea, and headache.

Although in this series of cases, subsequent hypertension has been frequent (27.5 per cent), one may not unqualifiedly infer from this that eclampsia results in hypertensive disease in so great a proportion of the cases. In a significant proportion, the hypertension was present before the eclamptic pregnancy; in others it may have been latent, and in others still, it may have developed subsequent to and independent of the eclampsia. The incidence of hypertension among parous women of comparable age who had not had toxemia was found to be 21.6 per cent (Breakey). Of our 29 followed patients who were known to have been free of hypertension and nephritis prior to the eclampsia, only three subsequently showed systolic pressures over 150, and these three patients were all more than fifteen years postpartum at the time of the last examination.

It would be difficult to believe that prolonged and severe toxemia, in previously normal patients, should not leave some irreparable vascular damage. That this is true is suggested by the high incidence of some degree of toxemia in later pregnancies even though the blood pressure

and urine are normal in the nonpregnant state. Undoubtedly the low incidence of subsequent hypertension (9.7 per cent) and the absence of albuminuria in our clinic cases is to be correlated with the circumstance that in them previous hypertensive disease, and nephritis were absent and the eclampsia was not preceded by prolonged and severe preeclampsia. Among the emergency patients, the greater incidence of subsequent hypertension (39.8 per cent) may have been due in part to the more prolonged course of the preceding toxemia which frequently occurred.

SUMMARY

A study has been presented of 173 patients with eclampsia who were treated at the Boston Lying-In Hospital during the twenty-year period from 1915 through 1934. The uncorrected mortality was 26.6 per cent. The mortality for patients who had attended the clinic prior to the development of eclampsia was less than for those admitted as emergencies. The mortality was higher in multiparas than in primiparas and was also higher in patients over thirty years of age. Reasons for these differences are discussed.

Of the 127 survivors of eclampsia, eight have subsequently died; three of recurrent pregnancy toxemias, two of severe hypertension with cerebral lesions, one of cardiac decompensation, probably of vascular origin, one of lobar pneumonia complicated by hypertension and possibly chronic nephritis, and one of cancer of the cervix. Eighty of the patients who survived the eclampsia have been followed from more than one to twenty-one years. The average follow-up interval is 7.6 years. The incidence of hypertension among these patients was 27.5 per cent, and the incidence of albuminuria 8.75 per cent. Evidence of significantly impaired renal function was found in only one case.

The patients were studied in groups with reference to their past histories as these concerned hypertensive disease and nephritis prior to the eclampsia. A significant number of them had hypertensive disease or nephritis prior to the eclampsia, and both the immediate and remote outlook for these patients was considerably poorer than for those known to have been normal before the eclampsia. Of the 29 patients followed who were known to have been healthy prior to the eclampsia, the incidence of subsequent hypertension was 10.3 per cent and that of albuminuria was nil. Such symptoms as were encountered at follow-up examination were largely explicable on the basis of hypertensive disease.

CONCLUSIONS

1. Eclampsia is frequently complicated by preexisting hypertensive disease and less commonly by chronic nephritis.

2. The immediate mortality of uncomplicated eclampsia is much lower than when it is superimposed upon preexisting hypertensive disease of nephritis.

3. The most common abnormal finding at follow-up study in patients who have had eclampsia is hypertension. In this series of cases its incidence was 27.5 per cent. The incidence of albuminuria at follow-up study was 8.75 per cent. These figures do not represent the true incidence of these two findings as sequels to eclampsia, for hypertensive disease and, less commonly, nephritis were sometimes present before the eclamptic pregnancy. Of 29 posteclamptics followed who were known to have been healthy prior to the eclampsia, none had albuminuria or evidence of impaired renal function, and only three (10.3 per cent) showed hypertension.

4. Such damage as occurs as a result of eclampsia would appear to be primarily vascular in character. Chronic parenchymatous nephritis, and significantly impaired renal function are uncommon sequelae.

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Banssillon, E., and Mounier-Kuh, P.: Concerning One Form of Epistaxis During Pregnancy. Bleeding Polyps of the Septum, Bull. Soc. d'obst. et de gynéc. **25:** 71, 1936.

Ordinarily nasal bleeding during pregnancy is not common and is not serious. The cause is usually ascribed to congestion due to pituitary action. In most cases examination reveals a simple congestive hypertrophy. Some authorities consider hemorrhages from the nose as symptoms of toxemias of pregnancy. The authors report an unusual case of nasal bleeding from a large polyp in the septum. This polyp disappeared spontaneously.

J. P. Greenhill.

Pillay, A. P.: Birth Control in India: Necessity and Methods, J. Indian M. A. **5:** 732, 1936.

The necessity for birth control in India is great. The author discusses the question of contraception as a public health measure and describes methods suitable for the poor to adopt. The well-to-do can afford diverse care.

The medicated tampon and a rubber sponge are means available for the poor. The tampon or sponge is soaked in a solution of equal parts of lemon juice and water or any bland oil. A reliable jelly may be prescribed.

Vaginal sterilization of the mother or vasectomy in the man are methods sometimes indicated.

F. L. Adair and S. A. Pearl.

THE MECHANISM OF THE PROLONGATION OF PREGNANCY IN THE RABBIT*

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THE length of gestation varies considerably in the different mammals and in the same species. Thus the rat carries her young an average of 20 days, the rabbit 30 to 32 days, the monkey 178 days, the chimpanzee 251 days, and the human female 267 days. Variations in the same species have been carefully studied by Hartman in the macaque monkey, in which animal it has been possible to make accurate observations. He noted a variation in the length of pregnancies in different animals but a less marked variation in the several pregnancies in the same animal.

Usually labor sets in spontaneously at term, so that normally the mature fetus is rarely retained in the uterus beyond this time. Like all biologic phenomena, there are exceptions in which labor fails to take place at the proper time, resulting in prolongation of gestation. While this is a rare occurrence, dire effects may result for the mother and her offspring because of the excessive size of the latter and the abnormal labor mechanism in the former. The biologic mechanism, by which the fetus is retained in the uterus until complete development and the initiation of labor at its termination, must be delicately balanced. The explanation of this mechanism has received considerable attention but as yet it has not been elucidated.

Of the many theories that have been advanced as an explanation of the normal mechanism for the termination of pregnancy, only two are worthy of serious consideration in the light of present-day scientific knowledge. One, the greater irritability of the uterus associated with an increase in the frequency and intensity of the intermittent contractions, finally eventuates in labor. In support of this theory, there is the increasing susceptibility of the uterus to mechanical stimulation and oxytocics as term is approached. The second is the hormonal theory, which presupposes the elaboration of a hormone by the corpus luteum which desensitizes the uterus to the action of the posterior pituitary gland. As term approaches this hormonal influence decreases, lowering the receptive threshold to hormonal and oxytocic stimuli.

In the light of our present work, a combination of the two theories may reflect the truth. More and more evidence is accumulating which suggests that the retention of the fetus in the uterus until maturity and the mechanism by which labor is initiated are both under hormonal control. Experimental studies of normal gestation, its artificial pro-

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longation and termination in the rabbit, offer an excellent approach to the problem. Undoubtedly, there are great species differences but the fundamental principles underlying the process may be the same in all mammals.

The physiology of reproduction in the rabbit is such that the process lends itself to experimental work in this field. It is for this reason that many fundamental processes have been worked out with the aid of this animal and a great deal of knowledge has been accumulated. Normally, the mature rabbit does not ovulate until ten hours after copulation. The absence of spontaneous ovulation and the regularity with which it occurs following mating are well-known biologic phenomena. Fertilization frequently results from a single copulation, thus further simplifying the exact determination of the onset of gestation. Hammond and Marshall have concluded that the average duration of gestation in the rabbit is thirty-two days, a fact which has been amply corroborated.

The development of a normal decidua in the uterus, the proper implantation of the growing embryos and the continuation of their normal development are all dependent on the maintenance of the corpora lutea. Ancel and Bouin demonstrated that the removal of the corpora lutea by castration or their destruction results in a failure of the mucous membrane to develop the typical progestational phase necessary for implantation. Furthermore, the embryos develop for several days but fail to implant on reaching the uterine horns. Weymeersch and others have established the fact that the removal of the ovaries in the second half of gestation in rabbits is invariably followed by abortion or premature labor. This observation has been amply confirmed by many workers in this field.

It can thus be concluded that in the rabbit the exact time of onset of gestation is known and under control. Furthermore, the proper development of the pregnancy and its successful continuation to term are directly controlled by the maintenance of the corpora lutea.

More recently, Corner, Allen and their coworkers have isolated a hormone from the corpus luteum, progestin, which can be successfully substituted for the normal corpora lutea in the rabbit. Their experiments prove that the development of a normal decidua in the uterine horns, the implantation of the embryos in the uterus and their successful growth and delivery at term can be accomplished in the absence of ovaries and their corpora lutea by the substitution of extracts of corpora lutea given daily by intramuscular injections. These interesting observations add another link in the chain of evidence that the corpus luteum controls gestation in the rabbit.

Aschheim and Zondek, Snyder and Wislocki, Hill and Parkes have all noted the fact that human pregnancy urine contains a substance which causes ovulation in pregnant rabbits. The new corpora lutea thus produced resemble the natural ones in every way, although according to Hill and Parkes their life is somewhat shorter and they produce more rapid involution in the corpora lutea already present. Although ovulation has been induced in animals other than the rabbit, the ease with which this can be accomplished depends largely on the dose and route of administration of the human pregnancy urine.

Snyder found that a single dose of 40 rat units per kilo of an extract of pregnancy urine (antuitrin-S) given intravenously would induce ovulation and develop a new set of corpora lutea in the pregnant rabbit. Furthermore, when this was carried out on the twenty-fifth day of normal gestation, the pregnancy failed to terminate at term but continued on for approximately fifteen days after injection, the life span of the new corpora lutea. It can be seen that new corpora lutea produced on the twenty-fifth day reach their maximum development and function about the thirty-second day, thereby disturbing the normal hormonal mechanism for the termination of pregnancy.

Watts, in 1935, reported that impure preparations of growth hormone of the anterior lobe of the pituitary produced a prolongation of pregnancy in rats of two to five days, as well as an alteration in the birth mechanism.

We repeated the experiments of Snyder, using a series of 15 pregnant rabbits. Animals that had been isolated were mated once and again isolated. Following the successful copulation, pregnancy was confirmed by careful palpation and, when necessary, by x-ray. Under these carefully controlled conditions thirty to sixty rat units of pregnancy urine extract (Parke, Davis and Company, antuitrin-S) were injected intravenously on the twenty-fifth day of the gestation. Abortions occurred in five of the animals on the twenty-sixth to the twenty-eighth day. These aborted fetuses were all living, normal in appearance, but definitely premature. In three of these cases the abortions probably took place as a result of too large a dose of the anterior pituitary-like substance. The mechanism of abortion is not entirely clear. However, the stimulation of follicular maturity by the pregnancy urine extract may result in a marked increase in the estrin content. It has been shown by Parkes and Bellerby that large doses of estrin will cause the early interruption of pregnancy in animals (Table I).

The ten rabbits that received 40 rat units per kilogram of body weight failed to go into labor at term. The pregnancy was prolonged from five to ten days, terminating spontaneously or artificially by cesarean section. When the pregnancy was prolonged beyond the thirty-sixth day, the fetuses were invariably dead at delivery. Those born alive were considerably larger than normal and more fully developed, indicating their postmaturity. The fetuses that were dead showed the usual signs of maceration and early absorption so typical of retained dead fetuses.

The birth mechanism sets in sometime between the thirty-eighth and forty-third day. This additional period probably represented the life span of the corpora lutea. With the waning influence of these new corpora, the retarded mechanism for the onset of gestation could now assert itself. As Snyder pointed out, the labors were likely to be prolonged, difficult and abnormal, partly due to the increased sizes of the fetuses because of overdevelopment. In several of the animals, one or two living fetuses were delivered twenty-four to seventy-two hours following the injection of the pregnancy urine extract, but the remaining fetuses in the litter would remain in the uterus, continue to develop

TABLE I. THE DURATION OF PREGNANCY FOLLOWING INTRAVENOUS INJECTION OF HUMAN PREGNANCY URINE EXTRACT*

NO. OF RABBIT	PARITY	DAYS PREGNANT AT INJECTION	A.P.L. SUBSTANCE (ANT.-S) GIVEN INTRAVENOUSLY	DURATION OF PREGNANCY (NORMAL 30-32 DAYS)	CHARACTER OF DELIVERY	FINDINGS AT AUTOPSY OR LAPAROTOMY	FATE OF FETUSES
87	2	25	40 units/kg.	35	Cesarean	6-7 fresh corpora lutea	7 living postmature
88	2+	25	40 units/kg.	34-35	Spontaneous—prolonged labor	4 fresh corpora lutea; necrosis of uterine wall	1 living on 34th day; 7 dead on 35th day; no maceration
102	1+	24	40 units/kg.	37	Spontaneous	None	3 dead, macerated
104	1	25	40 units/kg.	34	Spont.—72 hr. +	None	8 living postmature
119	1	25	30 units/kg.	41	Spont. 1, C.S. 4	8-15 new corpora; necrosis of uterine wall	4 macerated
131	1+	25	40 units/kg.	36	Spont.	None	8 macerated
134	1+	25	40 units/kg.	43	Abortion, 1 fetus on 27th day. Lap. on 26th day, 1 ovary removed	Fresh corpora. Normal uterine wall	1 living 8 macerated
136	1+	25	40 units/kg.	38	Spont., 8 fetuses on 43rd day. Abortion 27th day. 1 dead, young. 38 days: 3 postmature—dead	None	4 dead, macerated
140	1+	25	40 units/kg.	34	Cesarean	8-12 fresh corpora	6 living
170	2+	25	40 units/kg.	37	Spont. (prolonged)		6 dead, early maceration
118	1	25	40 units/kg.	26	Abortion—spont.	None	3 living
133	1	25	60 units/kg.	27	Abortion—spont.	8-15 fresh corpora	6 living
135	1	25	50 units/kg.	27	Abortion—spont.	None	9 living
141	3	25	60 units/kg.	27	Abortion 27th and 28th days.	None	3 living, 2 dead
169	1	25	40 units/kg.	28	Lap., left ovary removed 24th day. Abortion: spont. 28th day. Right ovary removed 28th day	8 fresh corpora	6 living

*Antuitrin-S, Parke, Davis & Company.

until the thirty-sixth or thirty-seventh day, succumb and finally be delivered as macerated fetuses at about forty days. This again is evidence of a disturbed birth mechanism (Fig. 4).

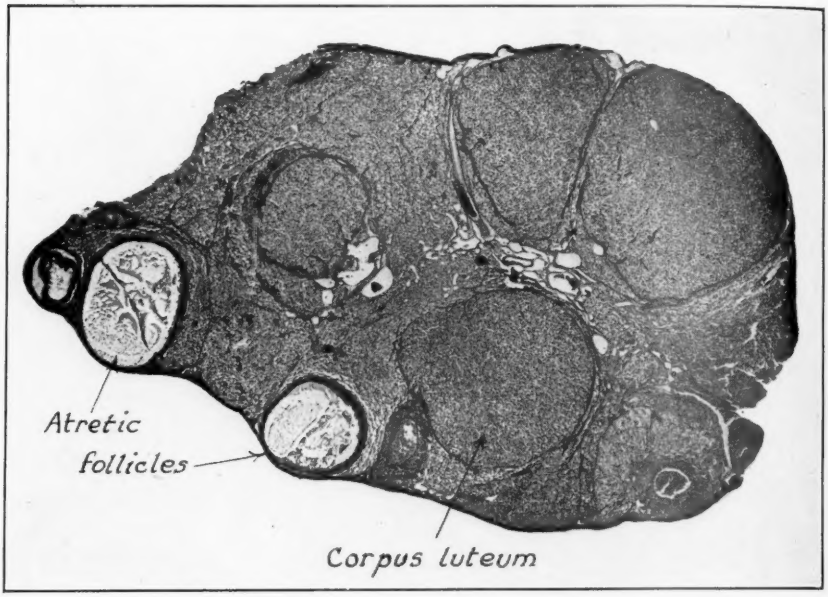

Fig. 1.—Left ovary (Rabbit 169) removed on twenty-fourth day of gestation prior to injection of antuitrin-S, showing well-developed corpora lutea and atretic follicles, corresponding to twenty-fourth day of normal gestation. (×16)

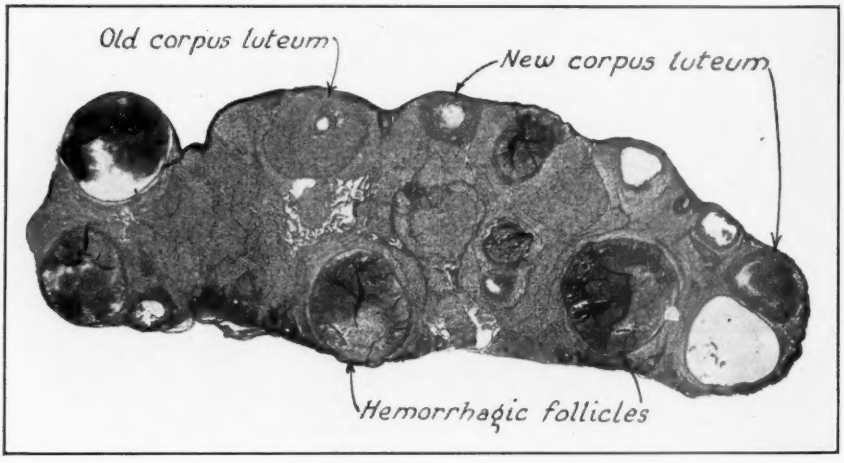

Fig. 2.—Right ovary (Rabbit 169) removed on twenty-eighth day of gestation three days following injection of 40 units per kilo of antuitrin-S, showing numerous old and newly developed corpora lutea and hemorrhagic follicles induced by antuitrin-S. (×8)

Laparotomy before the death of the fetuses usually revealed normal uterine horns distended with large, post-term fetuses. On removing

them from the uterus respiration would be initiated promptly. The ovaries were irregularly nodular and two distinct sets of corpora lutea could be seen. Histologic sections of these ovaries show these two sets of corpora distinctly. One group is retrogressing while the second group shows all the evidences of full maturity (Figs. 1, 2, and 3).

Laparotomy after the thirty-sixth day of gestation revealed dead fetuses in the uterine horns in various stages of maceration and early absorption. Their postmature characteristics were well defined, indicating their prolonged intrauterine existence. In the ovaries the artificial set of corpora lutea likewise showed evidences of retrogression but this process was much more manifest in the first set of follicles.

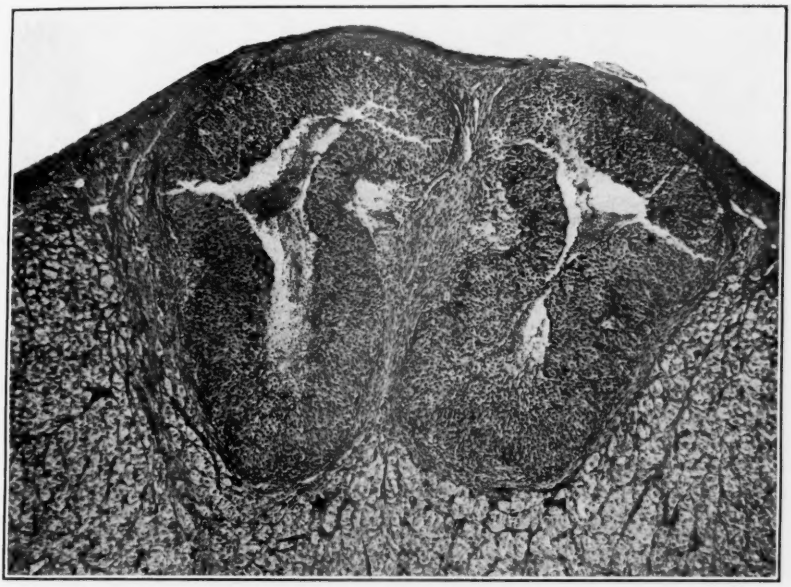

Fig. 3.—Right ovary (Rabbit 133), two newly developing corpora lutea following injection of 40 units per kilo of antuitrin-S. Note residual hemorrhage in the central cavity and tortuous margin of corpus luteum cells of collapsed follicle. (×75)

In several of our animals, the hemorrhagic extravasation into the uterine musculature with signs of early necrosis was observed, as noted by Snyder. These changes in the uterus probably set in with the onset of labor. We are at a loss to explain their significance.

These carefully controlled experiments confirm the important rôle that the corpus luteum plays in the regulation of gestation and its proper termination. If new active corpora lutea, induced artificially, can inhibit the onset of labor at term, extracts of the corpus luteum injected into the animals should be able to do the same thing. The success of such experiments would definitely establish the fact that the hormone elaborated by the corpus luteum itself was the direct or indirect etiologic agent involved in the artificial prolongation of gestation.

TABLE II. THE DURATION OF PREGNANCY FOLLOWING INTRAMUSCULAR INJECTION OF CORPUS LUTEUM EXTRACT

NO. OF RABBIT	DAILY INJECTIONS DURING GESTATION		DOSE	DURATION OF PREGNANCY (NORMAL 30-32 DAYS)	CHARACTER OF DELIVERY (LABOR)	AUTOPSY OR LAPAROTOMY	FATE OF FETUSES
	FROM DAY	THROUGH DAY					
151	25	33	2 R.U. (proluton)	27	Cesarean section	No new corpora	6 living
154	25	33	2 R.U. (proluton)	30	Prolonged 72 hr.		4 living
155	25	34	2 R.U. (proluton)	31	Prolonged		5 living
165	25	33	2 R.U. (proluton)	32	Prolonged		5 living
166	25	35	2 R.U. (proluton)	32	Prolonged		3 dead, 8 dead, macerated
168	25	30	1 R.U. (proluton)	32	Normal		7 living
173	25	34	2 R.U. (C.L.P. Winthrop)	33	(Lap., left ovary removed)	No fresh corpora	8 postmature
174	25	31	2 R.U. (C.L.P. Winthrop)	33	Prolonged	No fresh corpora	3 living, 2 dead
175	25	32	2 R.U. (C.L.P. Winthrop)	34	Prolonged 48 hr.		7 living
177	24	26	2 R.U. (C.L.P. Winthrop)	34	Abortion, ovaries removed 28th day		5 living
178	25	32	2 R.U. (C.L.P. Winthrop)	36	Normal		5 living
179	25	32	2 R.U. (C.L.P. Winthrop)	36	Normal		6 living, 1 dead
130	25	38	2 R.U. (progestin B.D.H.)	39	Prolonged	No new corpora	4 macerated
1A	27	36	5 Int. U. (progesterone*)	36	Cesarean	No fresh corpora, normal	7 large dead, early maceration
2A	28	37	5 Int. U. (progesterone)	38	Cesarean	No fresh corpora	6 large, early maceration
4A	28	33	5 Int. U. (progesterone)	36	Delivered 3 days following last dose of progesterone		5 large, macerated
5A	28	33	5 Int. U. (progesterone)	34	Cesarean	No new corpora	6 living
6A	28	41	5 Int. U. (progesterone)	41	Cesarean	No new corpora	7 dead, macerated
7A	28	40	5 Int. U. (progesterone)	42	Spontaneous		9 macerated

*(Proluton, Schering) 1 mg. crystalline progesterone = 1 international unit.

About this time, potent corpus luteum extracts became available and, most recently, crystalline progestin, progesterone, was introduced. The experiments with these potent preparations can be divided into two groups (see Table II and Fig. 4). In the first group, twelve pregnant rabbits were given daily intramuscular injections of two rabbit units of progestin in oil, beginning on the twenty-fifth day of the gestation and continuing until the termination of the pregnancy. These preparations were obtained from two different sources but both were accurately standardized. Of this group, gestation was prolonged to the thirty-sixth day in two animals and the thirty-fourth day in two others. The remaining rabbits delivered between the thirtieth and thirty-fourth day. In one

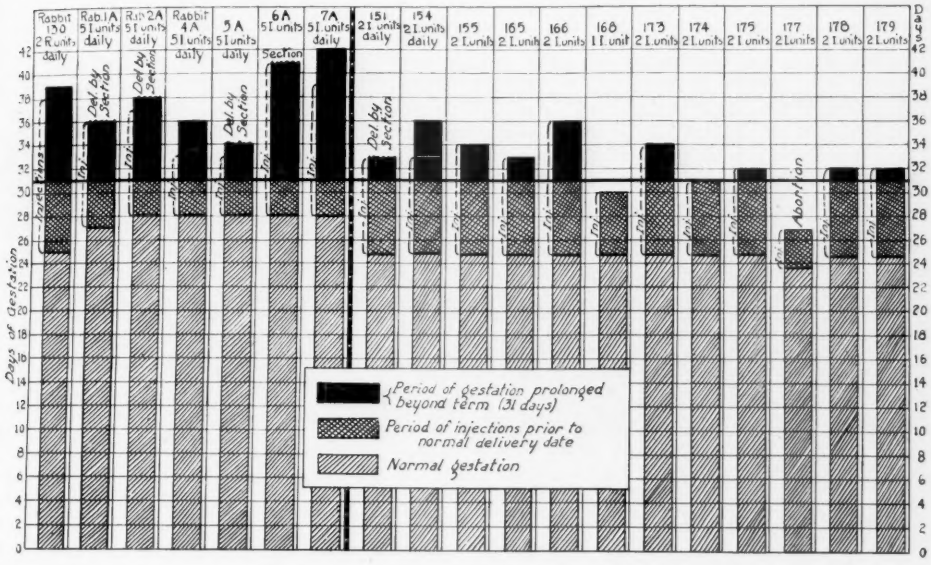

Fig. 4.—Graphic representation of Table II.

animal in which the pregnancy lasted thirty-six days, all the fetuses were delivered dead. Fetuses delivered between the thirty-third and thirty-sixth days showed evidences of postmaturity by their unusual size and state of development. Their mothers experienced prolonged and difficult labors.

The second group of animals received 5 mg. or 5 international units of crystalline progestin, progesterone, intramuscularly at daily intervals beginning on the twenty-eighth day of their gestations, and continued until the pregnancy was terminated either naturally or artificially. None of these animals went into labor at term but continued with their gestations until the hormone was discontinued, whereupon they went into labor twenty-four to forty-eight hours later. Sufficient experiments have not been carried out to determine whether the birth mechanism

can be permanently held in abeyance by the continued injection of progesterone until the fetuses have been extensively or completely absorbed. It is our impression, however, that this is possible. None of the rabbits went into premature labor during the administration of the hormone. It is likewise noteworthy that the fetuses succumbed about the thirty-sixth day and appeared in the same state of preservation following their death, as previously described. Those that survived were large, obviously postmature. When the birth mechanism was finally initiated, the labor was unduly prolonged, sometimes lasting forty-eight to seventy-two hours, in contrast with the normal length of two to four hours. This may be due to the excessive size of the offspring, but the

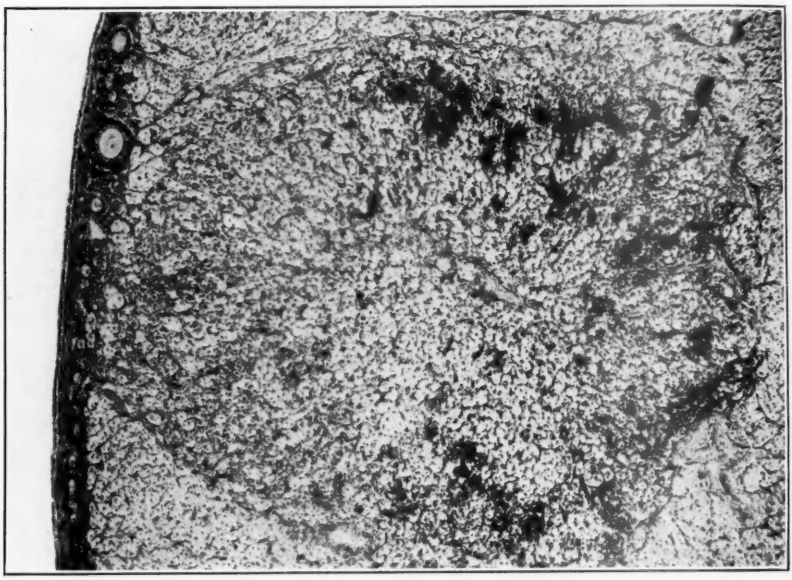

Fig. 5.—Ovary (Rabbit 7A) removed on forty-second day of gestation, ten days past term. Old corpus luteum showing marked involution, fibrosis and vacuolization of cells. (×75)

effect of progestin in diminishing the irritability or contractile power of the uterine muscle may also be factors.

Laparotomy performed on the thirty-sixth day or later revealed the uterus abnormally distended with living or dead fetuses. No hemorrhage or necrosis was evident in the uterine musculature. The ovaries were relatively smooth, pale, of normal size and showed no evidences of new follicle development or recent corpora lutea (Fig. 5).

These latter experiments add another link to the chain of evidence which definitely binds the corpus luteum to the rôle it plays in the control of the gestation. The hormone of the corpus luteum alone, in sufficient quantities, can inhibit the onset of labor and prolong the gestation. It is obvious from the foregoing experiments that a daily dose of

about 5 mg. of progesterone is necessary to inhibit the birth mechanism. Less than this amount may be ineffective as can be seen from Table II. It is possible that the minimum amount necessary was exceeded. Corner found that in a pregnant rabbit spayed at the eighteenth hour of the gestation, the use of corpus luteum extract will permit normal implantation and carry the fetuses to full term, providing the daily dose of the extract is at least five times that amount necessary to produce typical progestational changes. The rapidity of the hormonal action can be seen in that its use was delayed to the twenty-eighth day of the gestation.

DISCUSSION

A number of observations have been made by investigators in this field which throw some light on the mechanism by which pregnancy in the rabbit is prolonged. Reynolds and Knaus have noted the fact that corpus luteum extracts relax uterine muscle. Knaus found that in vitro preparations of rabbits' uteri, which are normally very sensitive to pituitrin, become refractory to the drug during the first half of pregnancy and during pseudopregnancy. In the latter part of pregnancy, however, the inhibiting effect of the corpus luteum diminishes and the muscle fibers become more sensitive to pituitary extract, so that the response of the uterus to pituitary extract when administered at term is immediate and powerful, and results in the volcanic onset of labor. In animals where pregnancy is being prolonged because of a new artificial set of corpora lutea or by the daily injections of progesterone, pituitary extract, even in large doses, has no effect in initiating labor. In experiments by Snyder and confirmed by us in rabbits under the influence of progesterone, pituitary extract in 1 c.c. doses given intravenously at term failed to cause uterine contractions. This inhibition of action of the drug persists until the corpus luteum effect has worn off. These experimental observations suggest that the mechanism by which gestation is prolonged resides in a diminished responsiveness of the uterine musculature to the usual stimuli that initiate labor. When the threshold of receptiveness has been lowered sufficiently by the removal of corpus luteum inhibition so that the uterine musculature is again responsive, labor sets in.

The corpus luteum in the human being does not seem to exert as fundamental a rôle as in the rabbit. Asdell found 34 cases recorded in the literature in which the corpus luteum was supposedly removed by castration during gestation between the first and seventh months, and all but four went to term without interruption. Obviously these cases do not represent the only occurrences of this kind, but they do emphasize the fact that in the human species the conditions necessary for the successful termination of gestation are not wholly dependent on the corpus luteum. It is possible that once decidual development takes place so

that normal implantation can occur, the rôle of the corpus luteum in the human female is taken over by some other tissue or organ like the placenta. Thus, van Lankeren found that a considerable amount of progestin could be extracted from the human placenta at any time during pregnancy. More recently, Philipp demonstrated the presence of progestin in the urine of the newborn which likewise may have been derived from the placenta.

Our initial experiments on this problem concerned themselves with crude extract of human corpora lutea removed during various periods of gestation. Daily injections of these extracts failed to produce the typical progestational phase in mature virgin rabbits. Daily implants of fresh corpora lutea likewise contained too little progestin to influence the experimental animals. In one case, however, extracts prepared from two human corpora lutea removed in the first trimester produced a doubtful response. These experiments indicate that the human corpus luteum in the latter half of gestation is a poor source for progestin.

The death of post-term fetuses, at approximately the same period in the gestation, is another interesting observation. Why these fetuses die when they have reached a certain age is difficult to explain. Progesterone is not toxic to mother or fetus and can be administered throughout gestation without untoward effects. Where fetuses were aborted following the administration of pregnancy urine extract they were alive and normal. Neither the lack of sufficient progestin nor its oversupply influences the fate of the fetus other than its premature delivery in the former instance. It must be concluded that altered environmental conditions result in its postmature fate.

In the human female, intrauterine death of the postmature fetus has often been noted and recorded. Kaern found that there was a definite relationship between postmaturity, excessive size of the fetus, and intrauterine death. Of 228 newborn infants weighing 4500 gm. or over, 116 mothers had a calculated duration of pregnancy of 291 days or over. The fetal mortality in this entire group was 14.9 per cent. Nine of these children were dead and macerated at the onset of labor, an incidence of 4 per cent. This can be compared with a gross fetal mortality from all causes of 3.3 per cent in the same clinic. Does this result mean an insufficiency of the placenta because of retrogressive changes in its substance, resulting in a gradually diminishing blood supply to a fetus rapidly increasing in size? The underlying pathology may reside in the progressive changes in the placental site because of retrogressive vascular changes. It is not likely that the fetus is in itself responsible for its postmature intrauterine termination. It is undoubtedly the victim of uteroplacental changes, the result of an environment obviously not meant for continuing the intrauterine existence of the fetus much beyond its normal period.

CONCLUSIONS

The corpus luteum hormone, progestin, is directly responsible for the maintenance of the pregnancy in the rabbit and its normal termination. The prolongation of gestation can be accomplished in two ways: First, by the induction of ovulation at the twenty-fifth day of pregnancy with the use of pregnancy urine extract. These new corpora lutea reach their maximum development and functional activity at term, thereby inhibiting the onset of labor and prolonging gestation until their influence has subsided, about fifteen days. Second, progesterone, crystalline progestin, can be substituted for new corpora lutea when given in sufficient amount by daily intramuscular injections, beginning as late as the twenty-eighth day of the gestation. It will likewise inhibit the onset of normal labor at term and prolong pregnancy as long as the injections are maintained. Labor usually sets in twenty-four to forty-eight hours following the cessation of the administration of progesterone. The uterus is not responsive to huge doses of pituitary extract when under the influence of progestin. It can thus be concluded that the maintenance of an adequate supply of corpus luteum hormone at term and beyond it definitely inhibits the onset of the birth mechanism.

When pregnancy is prolonged by new corpora lutea or by progesterone, large postmature fetuses are produced. If these are delivered before the thirty-sixth day of the gestation, they are alive and normal. Intrauterine death invariably occurs about this time, although the fetuses may be retained in the uterus as long as it is under corpus luteum influence. The cause of the intrauterine death of the fetuses when pregnancy is unduly prolonged is under investigation. These experimental findings have their analogy to many pathologic conditions in the human female.

We wish to thank the Schering Corporation and the Winthrop Chemical Company for supplying some of the corpus luteum hormone used in these experiments.

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PRIMARY DYSMENORRHEA—AN ENDOCRINE PROBLEM*

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DYSMENORRHEA offers one of the most difficult problems encountered in the practice of gynecology. In reviewing the literature one is impressed by the wide divergence of opinion which has existed in the past as to the incidence, the cause, and the treatment of dysmenorrhea. With such a multiplicity of views on the subject, one naturally questions whether the underlying nature of the disturbance has been uncovered. Certainly the results of therapy have been far from constant and satisfactory.

Recent advances in endocrinology have suggested that some endocrine imbalance might be the cause of menstrual pain. Our study is an attempt to discover if there is a disturbance in the endocrine mechanism of menstruation in patients suffering from dysmenorrhea which causes pain, and if so, its nature, cause, and possible treatment. We have approached the problem from two angles, namely, that of the laboratory and that of the clinic.

The laboratory approach consisted of assays of the blood and urine of patients suffering from dysmenorrhea for the estrogenic and gonadotropic substances. The Frank-Goldberger technic[1] was used in assaying the blood and urine for the estrogenic substance, the Aschheim-Zondek concentration technic for the gonadotropic substance in the urine and the Fluhman technic for the determination of the gonadotropic element in the blood. The 100 cases so studied fall into three groups:

Group I: This included fifteen unmarried women, ages sixteen to twenty-six, who complained of dysmenorrhea but who were otherwise normal. Blood studies were made once a week for one complete menstrual cycle and again the following month within five days of menstruation, for the purpose of titration. The results obtained are shown in the graphs shown in Fig. 1. Of the estrogenic substance only one patient had a level lower than normal. In twelve cases there was a demonstrable amount of the substance throughout the cycle, and rising to a peak just prior to the onset of menstruation at which time a mouse unit was found in 30, 20, and even in 10 c.c. of blood. In none of the cases was a positive Fluhman test obtained. In this group of

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cases of dysmenorrhea the findings were a higher than normal level of blood estrogenic substance and a normal or subnormal amount of the gonadotropic substance.

Group II: To determine whether or not the high blood level of the estrogenic substance found in Group I was due to excessive production or faulty elimination, a second group of 15 cases was studied in which the blood was assayed as in Group I and at the same time the urine was titrated for the amount of estrogenic and gonadotropic substances excreted during one monthly cycle. The results are summarized in Fig. 2. Here again is found a high blood level of the estrogenic substance. The general character of the excretion curve follows that of normal, but there is an excessive amount of the estrogenic substance throughout

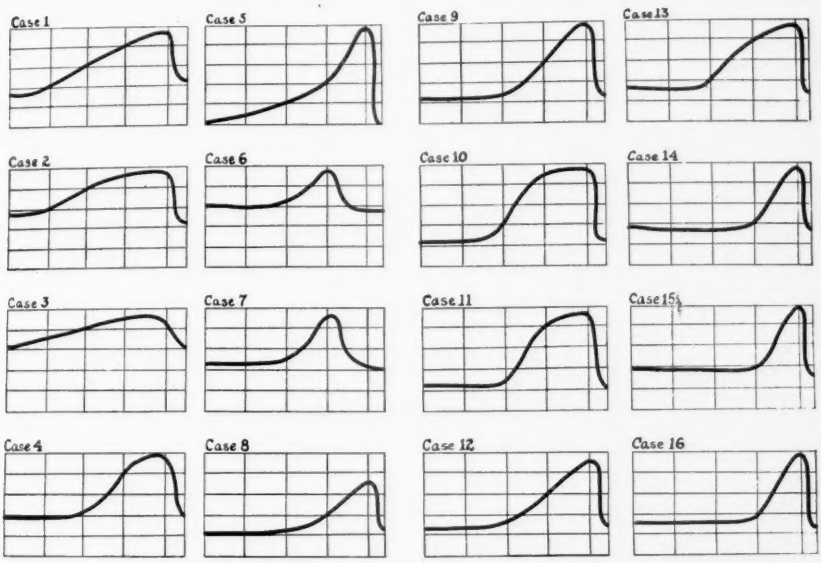

Fig. 1.

the cycle, the total amount being from two to four times that of normal. For the gonadotropic substance in the blood none of the patients gave a positive Fluhman test. Eight patients had a positive reaction in the urine, all occurring at about midperiod, a finding which is normal. Seven patients gave negative reactions throughout the cycle in the urine.

From these findings it seems safe to conclude that a high blood level of estrogenic substance is present in a large percentage of cases of functional dysmenorrhea, and that this is not due to faulty elimination by the kidneys, since the urine level is also higher than normal. Also, the gonadotropic factor in the blood and urine is either normal or less than normal in amount.

Group III: This comprises seventy unselected cases of dysmenorrhea in which no organic pathology was demonstrable, in which single blood

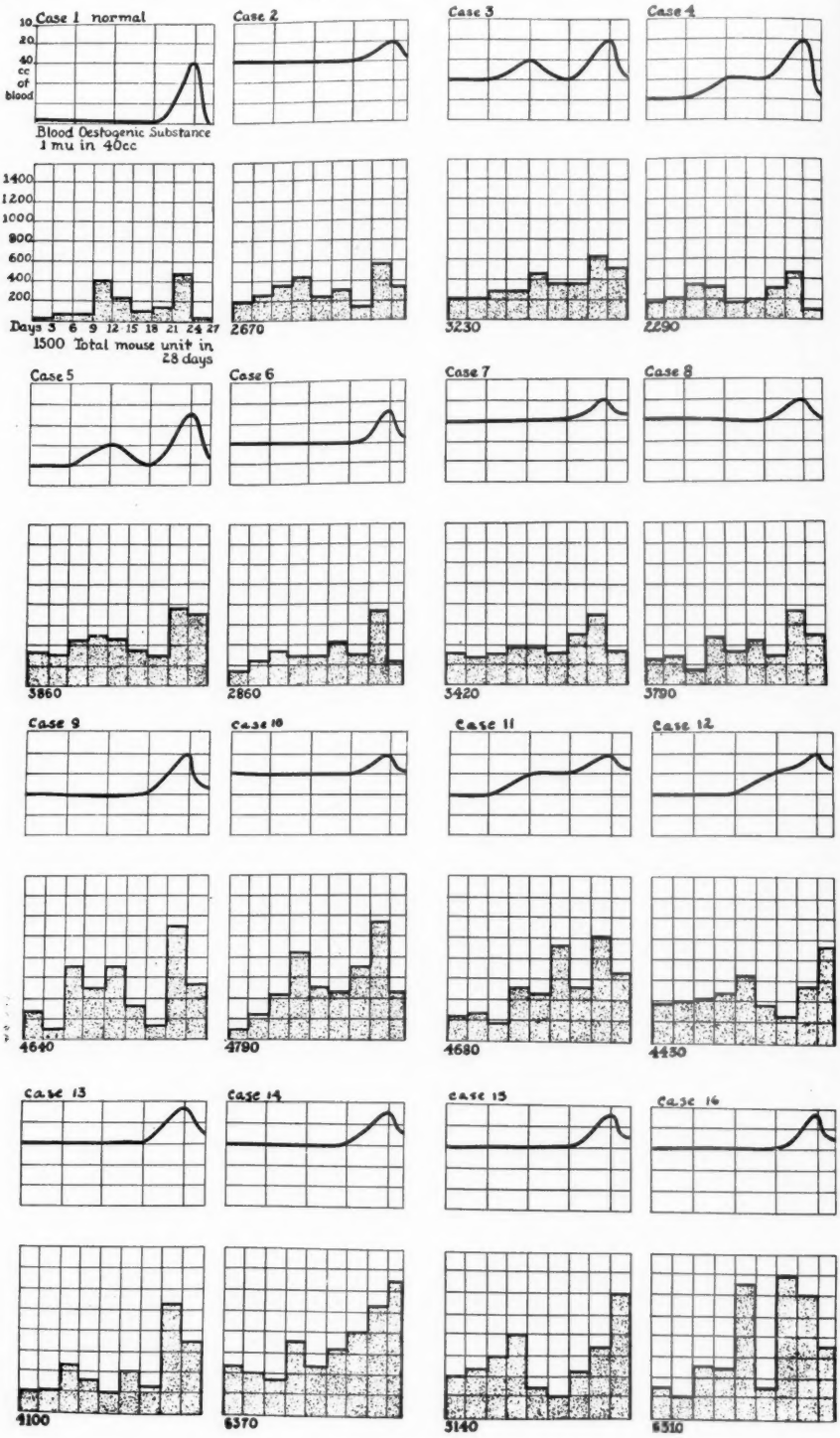
Case 1 normal
10
20
40
cc
of
blood
Blood Oestogenic Substance
1 mu in 40cc
1400
1200
1000
800
600
400
200
Days 3 6 9 12 15 18 21 24 27
1500 Total mouse unit in
28 days
Case 2
Case 3
Case 4
2670
3230
2290
Case 5
Case 6
Case 7
Case 8
3860
2860
3420
3790
Case 9
Case 10
Case 11
Case 12
4640
4790
4680
4430
Case 13
Case 14
case 15
Case 16
4100
6370
5140
6310

Fig. 2.

studies were made within five days of the onset of the menstrual flow. Of these 42 gave strong positive reactions, 24 gave normal positive reactions, and 4 weak positive reaction. These results seem to corroborate the findings of Groups I and II.

As to the cause of this excessive production of the estrogenic substance, we are unable at the present time to ascertain, since we are unable to make clinical tests for the progestin content of the blood and urine or blood assays for gonadotropic substance present in amounts less than normal. It seems probable since theelin and progestin have in many instances antagonistic actions, that this excess of theelin would be accompanied by a deficiency of progestin which is a type of ovarian failure. That this failure is not primary in the ovary is shown by the fact that the Fluhman test was in no cases positive. Hence, we are dealing with ovarian failure which is secondary in nature, and probably due to insufficient stimulation by the anterior pituitary gland.

We recognize that this excess of estrogenic substance in the blood and urine is not a unique finding: that it also occurs in certain types of amenorrhea, in functional bleeding, and in greatest quantities in pregnancy. We believe that it is not so much the actual amount of theelin present in any of these conditions as it is the theelin-progestin ratio which determines the clinical manifestations of the glandular disorder. The maintenance of the normal ratio is in turn dependent on the proper function of the pituitary gland.

Novak and Reynolds,[2] by a very ingenious method, have demonstrated that, in the rabbit, regular rhythmic contractions of the uterus occur, which disappear after castration and are restored by the administration of theelin. Also, that these contractions, excited by the administration of theelin, are depressed very markedly by the administration of progestin or prolan.

The pain of menstruation is usually of a sharp cramping nature, which may very well be due to excessive uterine contractions. For proof that strong uterine contractions cause pain, it is only necessary to mention the pain which is incident to labor almost without exception.

It is upon these findings that we base our concept of dysmenorrhea, namely, that it is due to a type of ovarian failure, secondary to anterior pituitary hypofunction usually, in which there is an excess of theelin and a deficiency of progestin, which disturbed ratio causes excessive uterine contractions which are painful. Upon this concept a routine of treatment was outlined and applied.

In selecting cases of functional dysmenorrhea for study the following classification was used:

I. Dysmenorrhea caused by Organic Pathology
   1. Pathology of the genital organs
   2. Constitutional abnormalities
   3. Combined local and constitutional abnormalities

II. Dysmenorrhea caused by Functional Pathology
1. Nonendocrine causes
a. Pelvic congestion
b. Allergy
c. Neurosis
2. Endocrine causes
a. Ovarian dysfunction, primary
b. Ovarian dysfunction, secondary
(1) Hypopituitary function
(2) Hypothyroid function

A correct classification is essential. It is the first and most important step in treatment, for, unless it is done properly, results of therapy will be only what could be expected from any "hit-or-miss" method. First, organic causes must be ruled out. This is not always easy, for often pelvic pathology is present which cannot be detected by pelvic examination. After the case is established as functional in origin, the type must be differentiated. We have recognized four types; of the nonendocrine causes, pelvic congestion is probably the most important. Neurosis, though considered in the past as the basis of many cases of dysmenorrhea, probably accounts for few, if any, cases. However, the mental and emotional status of the patient is very important. Allergy may account for an occasional case.

Finally, on establishing the case as endocrine in origin, two more questions must be answered: What gland or glands are involved and to what degree? and, are contributory causes such as pelvic congestion, anemia, poor general physical condition, or emotional instability present? When these steps have been carefully taken, then and only then can endocrine therapy be applied with any hope of success. Our routine of study for purposes of diagnosis and classification of cases consisted of the following procedures:

1. Complete history and physical examination
2. Vaginal or, in the virgin, rectal examination
3. Urinalysis
4. Hemogram
5. Basal metabolism rate
6. Hormone study
7. Blood chemistry, in selected cases
8. X-ray of the sella turcica, in selected cases.

By such a study, sixty cases were selected as suitable for endocrine therapy. The methods used and the results obtained are summarized in Table I. These cases have been observed for periods ranging from six months to three years, the majority having been treated more than one year ago. Of the 60 cases 53, or 88 per cent, were relieved, 6, or 10 per cent, were improved and 1, or 2 per cent, received no benefit from the treatment.

Based on the concept that dysmenorrhea may be due to an imbalance between theelin and progestin production, therapy should be directed toward a reestablishment of the normal ratio of these hormones. Theoretically, this could be accomplished either by supplying the deficient hormone or by stimulating the glands to secrete normally. Organotherapy constitutes the first method, and we believe that x-ray accomplishes the second.

TABLE I. RESULTS OF TREATMENT OF SIXTY CASES OF FUNCTIONAL DYSMENORRHEA

	TOTAL NUMBER OF CASES	RESULTS			CASES ALSO GIVEN THYROID			
		RELIEVED	IMPROVED	FAILURE	TOTAL	RELIEVED	IMPROVED	FAILURE
Antuitrin-S	13	12	0	1	5	4	0	1
Proluton	14	12	2	0	2	1	1	0
X-ray to pituitary	5	44	1	0	3	2	1	0
X-ray and antuitrin-S	21	20	1	0	12	12	0	0
X-ray and pituitary	7	5	2	0	4	4	0	0
Total	60	53	6	1	26	23	2	1
Per cent		88	10	2	44	38	4	2

In the use of organotherapy in the treatment of dysmenorrhea several products are to be considered, namely, the anterior pituitary-like hormone of pregnancy urine, the luteal hormone, thyroid, and theelin. The anterior pituitary-like hormone marketed under the names of antuitrin-S (Parke, Davis Co.) follutein (Squibbs), anterior pituitary luteum (Harrison, McKenna, Ayerst) is of questionable value, since it is doubtful whether this substance actually stimulates the human ovary to corpus luteum formation. Theoretically, the anterior pituitary luteinizing hormone has a restorative effect as far as the ovary is concerned, stimulating it to produce its own hormone, but it is substitutional as far as the pituitary is concerned. Hence, if the fault lies in the pituitary, this substance would be effective only as long as administered. In some cases, however, it seems that after the readjustment is made, the glands are able to maintain their balance and the disturbance does not recur. We used antuitrin-S with some success in the earlier part of our study before the luteal hormone became available commercially. Witherspoon[3] and Brown[4] have reported on relief of dysmenorrhea by the use of the urinary gonadotropic substance.

The luteal hormone is marketed as proluton (Schering, in strengths of $\frac{1}{25}$, $\frac{1}{5}$, 1, 5 international units) and as progestin (Upjohn). We have recently been using proluton, but purely as a temporary measure, since it is substitutional in its effects and cannot be expected to effect a permanent cure. It is given beginning two weeks preceding the expected period in doses of 1 c.c. containing one international unit, every other day up to the onset of the period. In severe cases the 5 interna-

tional unit strength is used and is continued throughout the period. This schedule is repeated for three months. The patient is told not to expect any results until the third period after the treatment is started.

Thyroid, when indicated, is a helpful agent. Theelin is definitely not indicated in the treatment of dysmenorrhea, except perhaps in the presence of an infantile uterus and even here the deficiency is better corrected by the stimulation of the pituitary gland. While we used theelin in some of our earlier cases, the amount then available was so small that we feel that it was quite ineffectual. Israel[5] found that gonadotropic and estrogenic substances were both ineffectual when used as the only means of treatment of dysmenorrhea.

The use of the x-ray to the pituitary gland[6] in functional disorders of the female was introduced by Hofbauer before the German Gynecological Congress in 1922.

Rubin[7] in 1924 used x-ray therapy to the ovaries and later to the pituitary gland in cases of functional sterility. Ford[8] and Dripp of the Mayo Clinic found irradiation helpful in relieving symptoms associated with the menopause and reported relief in 18 patients out of 29 cases of dysmenorrhea so treated. Newell and Pettit[9] reported relief of 72 to 82 per cent of cases of dysmenorrhea treated by pituitary irradiation.

The medical profession, as a whole, has been slow in accepting irradiation of the pituitary gland for functional disorders of the female. It is still being regarded as a destructive agent. Given in fractional doses in those cases in which it is indicated, it is, in our opinion, far more beneficial in the correction of functional disorders of the female than any endocrine preparation now available. The technic for x-ray therapy as described by Christie[10] is as follows:

"20 milliamperes, 200 K. V. P., 5 minutes, 60 inches distance, ½ mm. copper and 1 mm. aluminum filter (170 'r.' units) to right and left sides of the pituitary gland every three weeks for four treatments. At the end of this, patients may return in two months and another series may be given if necessary."

To summarize the treatment which we have employed in cases of dysmenorrhea, the following measures are used: (1) Instructions in general hygienic measures, (2) tonic when necessary, (3) thyroid when indicated, (4) proluton as outlined above, and (5) x-ray to the pituitary gland.

CASE REPORTS

CASE 1.—Mrs. M. F., aged twenty-seven. This patient was first seen May 7, 1935, complaining of severe dysmenorrhea which started after her marriage four years previously. Her past history was essentially negative. Menstruation started at the age of fifteen years, each period lasting four days, normal in amount, and occurred every twenty-six days. Pain, of abdominal cramping nature, started two days before the onset of the flow and was accompanied by considerable breast tension and at times marked skin eruptions and headache. It was necessary for her

to remain in bed. She had never been pregnant. Physical and pelvic examinations were negative. Basal metabolic rate was minus 8; urinalysis, negative; Hb. 78 per cent, R.B.C. 3,250,000, and W.B.C. 8,100.

Treatment consisted of x-ray to the pituitary gland June 20, July 11, and Sept. 16, 1935; thyroid gr. ½ t. i. d.; proluton as outlined above, for three months; iron ammonium citrate. The patient has been greatly relieved for the past twelve months. She no longer needs to stay in bed at her periods but occasionally takes a pyramidon tablet.

CASE 2.—Mrs. D. H., aged twenty-four, was first seen June 1, 1934, complaining of dysmenorrhea and irregular menstruation. Her past history was essentially negative. Menstruation began at the age of twelve years, each period lasting seven days and recurring every thirty-two days. She had had no pregnancies. The pain occurred about two days before onset of the flow, at times being so severe that she had to go to bed. It was accompanied by severe headaches and acne. Examination revealed her to be of the infantile type, being six feet three inches tall and weighing only 107 pounds. Breasts were small, hips narrow, uterus infantile. Basal metabolism rate was minus 21; urinalysis, negative; Hb. 74 per cent, R.B.C. 3,700,000, and W.B.C. 8,400.

Treatment consisted of: thyroid, gr. 1 t. i. d.; antuitrin-S given for one month and proluton the following two months; x-ray to the pituitary gland June 11, July 2, and July 23, 1934. Since completion of the treatment, this patient has had regular periods with no pain.

CASE 3.—Miss H. D., aged thirty-two years, was first seen Aug. 28, 1935, complaining of severe dysmenorrhea, backache, and headache. Aside from an automobile accident in 1931, her past history was essentially negative. Menstruation began at the age of fifteen years, each period lasting ten days and recurring every twenty-eight days. In the past few years the flow had lasted only eight days and had been less profuse than at the onset. The flow was preceded by about two days of nausea and vomiting, breast tension, headache, and acne on the face. Pain occurred on the first day of the flow. Examination revealed the patient to be infantile in type with small breasts, flat hips, and infantile uterus. The basal metabolic rate was plus 2; urinalysis, negative; hormone test, strongly positive blood estrin and negative pituitary; Hb. 80 per cent, R.B.C. 4,020,000, and W.B.C. 7,800.

Treatment consisted of x-ray to the pituitary gland on the following dates: Aug. 23, Sept. 23, and Oct. 15, 1935. Proluton in one-fifth rat units every other day in the two weeks preceding menstruation for a period of three months. The patient is greatly improved. She has had no nausea and headaches since the treatment and the pain is very mild.

CASE 4.—Miss C. G., aged thirteen, was first seen July, 1934, complaining of severe dysmenorrhea. Her past history was essentially negative. Menstruation started at the age of twelve years, each period lasting four days and recurring every twenty-eight days. Pain was present during the first part of the period making it necessary for her to remain in bed for at least one day. General examination was negative; a pelvic examination was not made. Basal metabolic rate was minus 4; urinalysis, negative; Hb. 70 per cent, R.B.C. 3,600,000, and W.B.C. 12,050; blood hormone tests, strongly positive estrin and negative pituitary.

Treatment consisted of: Thyroid gr. ¼ t. i. d.; antuitrin-S for one month and proluton 1 rat unit for two months as outlined above. This patient is greatly improved. It is no longer necessary for her to spend any time in bed.

CASE 5.—Miss R. P., aged thirteen and one-half years, was first seen June 12, 1936, complaining of severe dysmenorrhea and acne. Her previous history was

essentially negative. Menstruation began at the age of eleven years, each period lasting four days and recurring every twenty-eight days. Since the onset, pain had been so severe that she was obliged to spend at least one day in bed. Physical examination was negative. Basal metabolic rate was minus 29; blood hormone test, normal estrin and negative pituitary; urinalysis, negative; Hb. 80 per cent R.B.C. 4,200,000, and W.B.C. 7,500.

Treatment consisted of: Thyroid gr. ½ t. i. d. for three months. Since that time, this patient has had no menstrual discomfort and the acne is clearing up.

CASE 6.—Miss M. C., aged twenty-six years, was first seen July, 1934, complaining of severe dysmenorrhea. Her past history was essentially negative. Menstruation began at the age of thirteen years, each period lasting seven days and recurring every twenty-eight days. Pain was present throughout the period, clots occurred at times and nausea was also present. Physical examination was negative, except for pelvic congestion. Laboratory findings were also negative. The patient was given Elliott heat treatments to the pelvis over a period of two months. Since then she has felt fine, her periods have been normal without pain or nausea. Endocrine therapy in this case would have been useless.

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Unilateral absence of the uterine adnexa is rare. It occurs occasionally in lower forms of animal life, as, e.g., in the Scolecidae and the Turbellaria. In these worms only the left tube is developed and the right remains as a closed sac. In many sharks, the right tube is atrophied or at least smaller than the left. In certain bony fishes and in many reptiles and especially in birds there is failure of development of the right tube as a rule. In the monotremes this is generally the rule; vultures have both tubes. The cause is not far to seek. In the domestic hen of normal fertility, if there should be maturation of 280 fully developed eggs per year, the pelvis would be constantly occupied by eggs. In the lower mammals and some birds a large egg is produced which is covered by a hard or calcareous shell and surrounded by the tube but in higher mammals the egg is microscopic. In the elephant, e.g., the egg is exactly the same size as in the mouse, both being microscopic. The failure of development of the right tube in higher mammals and in the human being is a throwback to lower animal life.

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THE STATUS OF PSYCHOTHERAPY IN GYNECOLOGIC PRACTICE

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EVERY medical problem includes a psychologic component, but in certain conditions this plays a larger rôle than in others. The psychologic aspects of gastroenterology, cardiology, and urology are of particular interest. Gynecology is most intimate in its relation to psychotherapy for many reasons. A great proportion of unconscious conflicts deals with sex problems as a result of personal and social restrictions; thus it is not surprising that the genital zone is so often the center of attention and the target of projection. Any existing genital abnormality, dysfunction, or pathologic process is readily overevaluated.

Anthropology points out the predominating importance of the sexual function in the history of woman. At some of the sexually critical periods in a woman's life we meet with phenomena in which the verification of femininity is associated with bleeding and, often, pain; the onset of menstruation, menstruation itself, defloration, childbirth. The initial realization of sex difference and inferiority attitudes resulting from special circumstances at the time of such realization, have also been emphasized as traumatic. All these factors predispose to a vulnerability in respect to anxiety, the central theme of the neuroses. The cyclical functions are dependent upon glandular control which in turn is sensitive to sympathetic nervous changes, adding to the vulnerability.

It is for these reasons in part, that a large proportion of the patients applying to gynecologists have complaints in which the quantitative distribution of psychic factors makes us focus our attention in their direction. The gynecologist and obstetrician is readily chosen as the father confessor. An initial modesty barrier has been broken down. Transference is easily made. The gynecologist seems to be the logical person to consult in the matters of premarital counsel, marital maladjustment, frigidity, contraceptive problems, and sterility, in association with which there are so many conflicts.

Compared to other specialists gynecologists were not slow to recognize these facts. Some were pioneers in the total personality approach. A certain reluctance among the rank and file may perhaps be accounted for by the unconscious determinants of vocational choice. Additional lag can be attributed to the exigencies of time, the objec-

tion to the possible intrusion of the erotic motif into the consulting room, and the undoubted tediousness of the therapy as compared to surgery.

Soon, enormous clinic material was accumulated, establishing the cogency of acute factors such as for instance, fright, influencing physiologic processes; and of chronic influences, fears, hopes, wishes, suggestions and autosuggestions, leading not only to symptoms but to organic changes as well. These changes involve circulatory redistribution, changes in muscle tonus and in glandular secretion.

In gynecology we deal with these principally in the manifestations of pain, bleeding, and discharge.

Psychotherapy is useful in gynecology in a general sense in all patients, connoting an attitude about the rôle of the illness in the life of the patient and how the physician fits into the picture, and in a specific sense in selected cases. It has forced an increased emphasis on the search for all organic components and for reexaminations to exclude and evaluate them, the search for positive evidence of psychic factors in the personality, heredity, constitution, and biography, and the tertium quid, the linking of such factors to the specific manifestations in a dynamic fashion. Into this framework of psychotherapy, psychoanalysis fits in a threefold manner: As an appreciative basis, as an anamnestic technic, and as a therapeutic technic both in its orthodox form and in the application of its dynamics in nonanalytic therapy.

The symptoms and syndromes to be discussed below are not conceived of as psychic entities; as they are presented to the gynecologist they serve only as convenient points of departure. In reality the only entity is the whole patient, since any of these symptoms may be part of a general psychoneurotic or psychotic disturbance. (For instance, the cessation of menstruation in manic-depressive psychosis.) If this material were being presented to psychiatrists, the emphasis would be upon psychiatric classification.

Some examples of leading symptoms in gynecology which may be more or less influenced by or influence psychic processes are:

Amenorrhea.—1. A girl of twenty-one complained of amenorrhea. Her period was two weeks late; she had always been regular. She was to be married in two weeks. There had been one premarital exposure one month before, with adequate contraceptive precautions. Examination showed no evidence of gravidity, the Aschheim-Zondek test was negative. She was reassured and the period came on the next day.

2. A woman of thirty years has been amenorrheic for nine years since an attempt at rape by her fiancé, with whom she quarreled and from whom she separated. This was followed by a depression which lasted for months, which is repeated every year at the anniversary of the incident nine years ago. Hormone studies are completely negative. Investigation showed a cyclothymia and the above superimposed conversion symptom.

3. A woman of thirty-five complained of amenorrhea of six months' duration, with distention of the abdomen, nausea, and vomiting. This was diagnosed elsewhere as pregnancy and finally, as a tumor, for which she was operated upon at a hospital. At the time of operation the uterus was small and nothing was found to correspond to the supposed tumor. This case of pseudocyesis in a hysterical individual is a gross example, minor forms of which are quite common. In women who have conflicts about childbearing and who are sterile, we frequently see the triad of symptoms of distention, pain under the left breast, and a feeling as if something were moving around in the abdomen. We have seen the complete picture of a false pregnancy coming on postpartum as the first external evidence of a beginning severe manic-depressive psychosis which soon required institutional treatment.

It is clear that amenorrhea may be a symptom of a variety of mental conditions ranging from an acute and temporary fear through various degrees of hysteria to the severest psychosis.

Menometrorrhagia.—There is ample evidence that irregularity in the amount and time of the bleeding may result from mental causes. But here we are treading on dangerous ground. The exclusion feature of the diagnosis is difficult, and it is quite dangerous to neglect early recourse to diagnostic curettage.

The onset of menstruation as well as its cessation is often associated with psychic disturbances. The reaction to the first menstruation will depend upon the entire developmental experience of the girl plus the specific preparation for the event. It is in the prophylactic sphere that the teachings of psychoanalysis infiltrating through all of society, pedagogy, and more immediately, the attitude of the parents, can accomplish most. Superstitions can exert marked and lasting influences. (For instance, the barbaric custom of a sudden slap by the mother at the girl's announcement of the initial bleeding.) We are all aware of the pernicious effect of overcoddling and the invalidism attitude.

At the *menopause* there is a considerable concomitant variation between the severity of the subjective complaints and the degree of maladjustment as discovered by careful investigation. This does not say that the symptoms are invariably psychogenic. The results of psychotherapy, however, when compared in large series of cases are as good as the other forms of therapy. A warning is in order to proceed slowly and cautiously in the psychanamnesis in these women because of depressions, melancholia, etc. In this group with somewhat limited resources for reequilibration, we must be careful not to disturb relatively harmless, sometimes very useful symptoms, since we may break down a defense mechanism and have nothing to offer in its stead. Some of the facts found in disturbances at this period are: the fear of growing old and dying, which is mobilized by the cessation of bleeding; the fear of losing attractiveness, losing the partner, disturbing his potency, and loss of libido; the realization of the impossibility of further childbearing, and the unrealistic, unconscious wish to have more children,

converted into hysterical symptoms, often involving the gastrointestinal tract; ideas of jealousy (paranoid) in which the jealous delusions may be projections of unconscious wishes for infidelity; accentuation of certain attitudes toward the grown children, largely in the service of the wish to keep them young, attached, and interfering with their marriage or leaving the home.

In the surgically or radiotherapeutically induced menopause, much can be done by prophylactic psychotherapy. The effect upon the libido varies considerably and is dependent on individual factors.

Pelvic Pain.—Among the clinical pictures frequently met with in the group under discussion, we include dysmenorrhea, dyspareunia, ovarian neuralgia, some cases of mittelschmerz, and certain paresthesias, of which the most troublesome one is pruritus vulvae. One may also include the right-sided pain often found in young single adolescents, so often associated with a masturbation conflict and so often operated upon for chronic appendicitis.

Dysmenorrhea continues to be a baffling symptom; even when we exclude the women with pelvic tumors, displacements, endometriosis and detectable hormonal disturbances, a great number of sufferers are left. In some of these psychogenic factors are contributory or determining. Before subjecting the severest cases to such operations as sympathectomy, expert psychotherapy is certainly indicated. This is true not only for menstrual cramps, but includes premenstrual vomiting, premenstrual tension or depression. It must be remembered that dread of the ever recurring distress may in itself *lead* to an anxiety state, which adds to the therapeutic difficulties. The generalizations that have been frequently made in regard to masculine protest and penis envy are by no means universally applicable. The results of prolonged mental treatment are, however, very encouraging and often save the patient from operation or drug addiction. Suggestive treatments are almost invariably only of temporary value. This is true of the intranasal treatment as well.

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The majority of cases of dyspareunia coming to the gynecologist are primarily psychogenic, although all cases have some psychologic factors. The more these factors are taken into account, the more efficacious the treatment. One must interview the husband as well, as, obviously, he may be the one who requires attention.

For practical purposes the treatment of psychogenic dyspareunia may be divided into:

A. *Initial dyspareunia* of which there are the mild, the severe, and the extremely severe forms.

1. In the mild type, there is a somewhat excessive reaction to an unfavorable situation, as for instance, an inept, inexperienced hus-

band, an unusually thick hymen, a timid individual; the patient is cooperative and has insight. In these cases the treatment can be rapid and one can very well combine local treatment with psychotherapy. This method embodies the dynamics of the psychotherapeutic cure without any attempt to give the patient conscious insight. In this respect it is similar to many forms commonly used in medical treatment, but differs in that the physician is more aware of the mechanism.

At the first visit the patient is interviewed (mostly listened to) and preferably not examined. When an examination is eventually made, it is but an inspection. There should be no pain. The doctor gets the woman's confidence.

An endoscope is inserted through which a wick of medicated gauze is passed and left in. At subsequent visits very gradual mechanical dilatation combined with the local applications finally permits the easy introduction of the smallest vaginal speculum. This is replaced by a series of graduated test tubes up to 1¼ inches in diameter. Then the patient is shown how to introduce this test tube herself, which she does with ease. Then she is given the test tube and instructed to introduce it herself at home for several days. The husband is interviewed and instructed, and all treatment tentatively discontinued before the couple make any attempt at coitus.

The underlying principle is the establishment of confidence and the transference through which the fear, resentment, and anxiety are partially overcome. This permits the alleviation of the local condition by mechanical means which is presently replaced by an instrument with phallic significance. The patient is encouraged to be cooperative in its introduction. The treatment is then terminated and the patient returns to her coital function with an altered point of view. I do not think one need fear the danger of instituting autoerotism principally because these women are not vaginally erotized.

2. In severer cases we see an inadequate response to a not unusual situation. There is no disproportion and there are other manifestations of a neurotic make-up; cooperation is not complete and insight is often lacking. In these cases the approach should be purely psychotherapeutic up to the point where the patient is herself desirous of having local treatment started.

3. In the extremely severe forms, as for instance in the cases of persistent virgins for many years, we must be extremely cautious. They are frequently psychopathic personalities. Interference here is not without considerable danger of a complete breakdown and even suicide.

B. *Acquired Dyspareunia.*—In the first group resulting from fear of pregnancy one may combine a brief psychotherapy with adequate contraceptive advice. In the group in which the dyspareunia is a result

of a negative reaction against the husband, local treatment is of no avail. Brief psychotherapy of the suggestive type is almost always doomed to failure. Prolonged psychotherapy offers only a reasonably fair prognosis as far as the dyspareunia is concerned. The prognosis is poor in respect to the frigidity.

* * *

Training in psychoanalysis has a triple usefulness in the treatment of these cases: (1) It offers the road to the possible understanding of the complex mechanisms through which these conditions arise. (2) It offers a technic for intelligent listening in the eliciting of an adequate history. (3) In very carefully selected cases, it offers a radical therapy which attempts to combine the removal of symptoms with an adjustment or readjustment of an unhappy individual.

Pruritus Vulvae: Some cases of pruritus vulvae which defy all other means of treatment respond to intense psychotherapy. The approach to these, however, requires as a preliminary an interruption of the vicious circle that scratching produces more pruritus; a temporary alleviation is the entering wedge. Unconscious masturbation in a sexually frustrated individual is, of course, the most common mechanism; yet saying so, bluntly, is of no use and often has unfortunate results.

Leucorrhea: In addition to the cases of leucorrhea due to local and general causes, we find some in which no cause can be found, and there is a persistent thin, mucoid, occasionally even mucopurulent discharge, varying with mental conflicts, influenced by mood changes and eradicable by an attention to the total person. Ungratified instinctual urges, constant daydreaming and turgescence, masturbation conflicts, premature ejaculation on the part of the husband, are some of the things frequently found in these patients. But it is not only in the so-called "fluor albus" that we find psychodiagnosis and therapy necessary. Even in the most specific infections it may sometimes be essential to investigate and treat the mental contributory factors, the perpetuating faulty sex practices and the secondary gains from the illness. For instance, in a series of 100 cases of *Trichomonas vaginalis* vaginitis, the overwhelming majority of the sexually active women had inadequate gratification.

One of the most important groups which includes a variety of links between gynecology and psychotherapy is that of marital maladjustment. This subject has been of major interest in recent years. Many patients come to the gynecologist with overt maladaptations to marriage or with symptoms which are more or less readily reduced to that issue. The gynecologist can accomplish a great deal in certain of these situations, in direct proportion to the extent of his training in psychology. Incidentally, much can be done prophylactically by pre-

marital instruction. Books, no matter how well written, do not begin to compete in value with personal management of these cases.

* * *

In the field of contraception, psychotherapy is of obvious importance. We can touch upon but a few of the many issues that arise. The widespread practice of coitus interruptus is no doubt compatible with mental and physical health in many men and their mates, somewhat dependent upon the degree of control in the case of the man, and the rapidity of orgasm in the woman. On the other hand, it is often associated with disturbances in the form of neurasthenia or psychoneurosis. When long-continued, especially when associated with premature ejaculation, the chronic pelvic turgescence in the woman without deturgescence may result in subjective fullness, pain, dragging sensations, paresthesias, and may actually lead to the objective signs of thickening, shortening, and tenderness of the uterine ligaments. Many of these women can be considerably helped by a change in their contraceptive technic combined with instruction, encouragement and psychotherapy of their partners. Proper contraception is an important factor in many cases coming to the psychotherapist. We must, however, not overlook the fact that the anxiety associated with the fear of pregnancy is *not* always relieved by realistic means and may require extensive further investigation and treatment.

The sterility clinic offers an enviable opportunity to study a large variety of neurotic conditions. In addition to the overt self-evident reasons for concern about sterility, we encounter exaggerations of affect which emanate from ego injuries, from the necessity and impossibility of proving self-doubted femininity or establishing mother identification. Failure to cure sterility, or, in lieu thereof, to adjust by means of adoption or substitutive gratifications, may result in tragic consequences. Many of our cases of cancerophobia are recruited here, for reasons every psychiatrist will gather. The function of the gynecologist, then, does not end when he is confronted with a hopeless prognosis.

Frigidity, from the gynecologic standpoint, can be divided into the primary and the acquired types. The prognosis is far better in the latter group. The situation is complicated by the fact that we are dealing with two protagonists, often with two neuroses that do not dovetail. The principle in therapy is a judicious retracing of the preceding life situations as far as is necessary. The prognosis must be cautious and radical psychotherapy should be instituted only after the most mature deliberation.

Frequently, we find marriages in which one or both partners have latent homosexual trends. These marriages may have compensatory values. Great care must be exercised in case management not to disrupt a marriage needlessly.

The endocrinologic aspects of gynecology are also rich in psychologic problems. We see here profound injuries to self-esteem, in cases of obesity, hirsutism, and distortion of body proportions. There are feelings of inferiority consequent on lack of femininity or its accepted standards and difficulties, arising from lack of attractiveness and delay or impossibility of marriage. The same is true of congenital gynecologic abnormalities. The most notable example is absence of the vagina, in which the necessity of a construction of a vagina is of individual, rather than social importance. We have seen splendid examples of complete adjustment in previously very depressed individuals following the Frank-Geist operation for absent vagina, though it is true that a temporary adjustment may merge into a later breakdown because of the absence of children.

Certain examples from the field of obstetrics require mentioning. In the vomiting of pregnancy we have an example of an intricate interlacing of conscious and unconscious mental factors with nervous, hormonal, and chemical ones. Clinical data point to its greater frequency when a conflict in regard to childbearing is present or where there are antagonistic attitudes toward people in the environment. In the choice of obstetric analgesia, the modern obstetrician individualizes according to the psychologic need of the patient in preference to proceeding by any rule of thumb.

The mental attitude toward nursing a baby is also subject to considerable variation. Insight into the causes of objections to it and patient discussion will do much to alter an all too prevalent attitude.

It may be misleading to lay too much emphasis on presenting symptoms; in the majority of instances it will soon be evident that the chief complaint is only one of a large number that may appear one after another, or in groups. Often we can derive the common denominator to see the usefulness of the symptoms to the patient and understand how they all defend against a single threat and thus get an insight into the basic anxiety. In a psychoanalysis the focus of attention shifts rapidly from the single symptom to the total personality.

Experience in this type of work and extensive contact with the actual treatment of neurotic women will permit the physician to make certain important immediate decisions and avoid certain pitfalls. Automatically he asks himself, "Is the complaint really explained by the organic findings? If not, is it connected with a psychic situation? Is this within the realm of accessibility to me or to some one else? What resources are there for adjustment? What methods are there at my disposal?" As a corollary of this, he automatically classifies the conditions into those that are organic from the practical standpoint, organic with a psychic utilization, primarily psychic with or without organic consequences. Furthermore, he will group the cases into those that are (1) mild and recent, amenable to simple therapy

which is directed to an adjustment to, a reconciliation with, or an alteration of, the environment, or to reassurance. (2) More serious psychoneuroses, amenable to psychotherapy in the hands of a trained person, or not at all amenable. (3) Psychoses in which insight is partly or totally lost.

There is a great need as well as great difficulty to put the case into very simple words. This involves the danger that in so doing we forget that the problems presented are not really simple. Perhaps the following statement is oversimplified: confronted by a contemporary problem the patient finds a difficulty. The normal pleasurable satisfaction not forthcoming, the frustration leads to anxiety. The result varies with the vulnerability of the person and depends on the physical and the mental make-up and biography. Previous patterns of behavior determine the choice of the defense against suffering. These defenses vary from the crystallization into a character type to all degrees of flights into illness, even to suicide.

Our function then, according to this statement, would be to study and understand contemporary problems which subjects find difficult, to know what is normal pleasurable satisfaction, what causes their frustration; to understand manifestations of anxiety, the factors making for individual vulnerability, and to be able to evaluate biographic facts. In addition, he must know the usual patterns of behavior, the common defenses, and be able to comprehend the end-results, such as character types and flights into illness. Such an approach requires, in addition to training in all of the social sciences, the patience to "project one's mind over considerable period of time."

In the out-patient department we have had the opportunity to investigate a large number of cases of incontinence of urine. We have been thoroughly impressed that in those cases without cystorectocele and with negative cystoscopic findings, a psychogenic factor is frequently present. This opinion has been reenforced by the relatively poor results of various forms of operative intervention in such women. Correspondingly gratifying results have been obtained with psychotherapy in these patients, at least half of whom have been relieved of this symptom. It is hardly feasible to enter into the psychic mechanisms at this time. In passing, it may be mentioned, however, that attitudes of spite, resentment, and masculine protest are common. For example, a young woman who had suffered from nocturnal enuresis up to the time of her marriage was completely relieved of this symptom with the establishment of satisfactory sexual relationship. Following a frigidity which was acquired later, she developed urinary incontinence which in turn disappeared with the cure of the frigidity.

There are definite differences in the practical application of psychotherapy and psychodiagnosis in private practice, the clinic, wards, and consultation service. In clinic practice emphasis has been pri-

marily on diagnosis and the therapies used have been in the direction of adjustment, suggestion, modification of the environment and a considerable utilization of assistance of the psychiatric social service department. In clinic practice such assistance is practically indispensable. A close cooperation between medicine and social service is of the greatest value to both. There are clear-cut limitations to the amount of time at our disposal with these patients since the number of such patients is enormous and properly trained assistants relatively few. On the wards, a somewhat more intensive observation is feasible. There is considerable evidence in favor of the value of a routine psychanamnesis of all ward cases, because exterior calm and complete cooperation with the ward procedure may easily mask a really important neurosis. We cannot rely on surface phenomena.

Even if the psychologic investigation as such is not routinely done, it would be quite possible to improve upon the routine histories taken, to fill in certain clear-cut deficiencies. Internes and residents could very well be instructed to add such details as the developmental history with emphasis on chronologic sequence and an attempt to see the relationship of events, such as illnesses, to the adjustment of the patient's life. In addition, greater emphasis could be placed on the marriage relationship, the question of coitus, contraceptives, etc. It takes relatively little time to add a brief outline of the patient's background, schooling, hobbies and resources, her attitude to children, etc.

In the consultation service it goes without saying that psychologic investigation is of paramount importance. Here we deal with obscure cases, a much larger percentage of which have no obvious organic findings. In this group there is an excellent opportunity of testing out the diagnostic value of what can be called the "one-hour interview." Though it has distinct limitations and in spite of the fact that later interrogation may alter, discount, even completely reverse the result of some first interviews, on the whole this plan has been found extraordinarily useful and in trained hands an amazing amount of information can be elicited in this single interview. This is often enough to clinch the impression of a psychogenic disorder and to point the way to an appropriate psychotherapy. It is thus not time-consuming in proportion to other forms of medical investigation.

* * *

Objections have been raised against psychotherapeutic treatment by the doctor who treats organic ills as well. Some of these are valid. It is difficult for a busy physician to spend the necessary time for the special study required in preparation and for treatment. Furthermore it is inadvisable to be in the position to be consulted about intercurrent medical conditions as these are so readily utilized for purposes of resistance, and to gratify unconscious wishes for physical

contacts. It is hard to maintain the necessary impersonal note. This split, however, can be exaggerated into fanaticism. In all psychotherapy short of formal analysis, the difficulties are relatively slight. As a matter of fact an intimate knowledge of both fields is of advantage in case control and avoids the danger of overlooking the significance of important intercurrent symptoms. It is only in formal psychoanalysis that the adherence to a sound orthodox technic makes it necessary to adhere to the rule not to examine the patient after an analysis has been started, and to summon the assistance of a colleague for such check-up examinations as may prove necessary.

When we ask ourselves what we can do for these patients, I am opposed to the point of view that a case is either organic or a case for analysis. There are a number of agents at our disposal. We can lessen the load, organic or mental, or both; we can give sympathy, support, and a point of orientation; we can tend to modify the environment, if necessary with the assistance of social service; we can assist in the acceptance of reality; we can try to remove or alleviate anxiety; we can build up general resistance, strengthen the ego to compensate for frustrations, and we can use the various forms of symptomatic and suggestive therapy in cases that do not lend themselves for obvious reasons to formal psychotherapy. Such suggestive therapy is used in conjunction with the use of local treatment such as pessaries, hydrotherapy, etc., or general treatment with so-called placebos. The judicious use of sedatives when indicated is of considerable importance. We should give attention to the timing of such sedation with due reference to the question of depression, or agitation and insomnia.

The gynecologist, then, should know psychotherapy for the following reasons:

1. To be able to elicit a psychanamnesis.
2. To avoid certain difficulties in the case management of sick women.
3. To know when to supplement his gynecologic therapy with psychotherapy.
4. To use the latter prophylactically, as in premarital instruction.
5. To understand the dynamics of many of his medical and surgical cures.
6. To know when and when not to recommend formal psychotherapy such as analysis.
7. To know when to avoid the subject.
8. To know more about himself.

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PARAMETRIAL FIXATION OPERATION FOR UTERINE PROLAPSE

Technic and Review of 254 Cases

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THE surgical treatment of uterine prolapse is a subject of perennial interest to the gynecologist. For in spite of the fact that several operations have been devised for the cure of prolapse, the most widely used procedures which have given the best results have the objection that they necessitate either removal of the uterus or sacrificing the function of the vagina. Thus, while vaginal hysterectomy or colpectomy will cure uterine prolapse, the usefulness of these procedures is confined to a comparatively small group of patients in whom the uterus and vagina play neither a physiologic nor a psychologic rôle. And, inasmuch as the majority of patients with uterine prolapse fall within the sexually active age group, a plastic procedure, to be of wide applicability for the cure of prolapse, should not entail the loss of the uterus and should not compromise the function of the vagina as a coital organ. If, in addition, the procedure were entirely vaginal and did not require laparotomy for some form of ventrofixation or suspension, it would fulfill the theoretical requirements of the ideal operation, viz., physiologic as well as anatomic restitutio ad integrum with a minimum of surgical risk.

This communication concerns itself with the description of such a procedure and a review of 254 cases of prolapse treated by this method.

HISTORICAL

The combined operation of amputation of the cervix and anterior and posterior colporrhaphy for the cure of prolapse was first performed by Donald of Manchester in 1888.[3] While this procedure was subsequently used widely in England and was apparently the only procedure employed for prolapse on Donald's service, he did not publish his technic until 1921.[1] However, Fothergill,[2-4] a pupil of Donald's, described the operation with slight modification in 1908. Subsequently, Shaw[5, 6] published the technic of the so-called "Manchester operation" as employed at the St. Mary's Hospital, Manchester, England, where the operation was first performed by Donald. A procedure somewhat similar in principle was employed by Halban and described by Mestitz in 1932.[7] In 1932 Robert T. Frank[8] introduced a modification of the Donald operation at the Mount Sinai Hospital. In 1935 he reported a series of 106 cases and suggested the name "parametrial fixation" for the operation.

TECHNIC OF OPERATION

The patient is placed in the lithotomy position, is catheterized, and the vagina is scrubbed with green soap and water. The cervix is grasped with a vulsellum

and the cervical canal is thoroughly dilated. A curettage is performed routinely. Fig. 1 illustrates the incisions made in the anterior vaginal wall beginning one inch below the urethral meatus. The incisions are carried downward and laterally circumscribing the cervix on each side at a distance of about two inches proximal to the external os (Fig. 2). The size of the triangular denudation is determined by the size of the cystocele, and the level at which the incision circumscribing the portio is made, is dependent upon the length of the cervix, the extent of the prolapse, and the degree of redundancy of the mucous membrane of the fornices. The triangular mucous membrane flap over the cystocele is then dissected from the underlying fascia and the lateral flaps of vaginal mucous membrane are then freed widely on each side, exposing the subjacent pubocervical tissues. The cut edges of the mucous membrane on each side of the cervix are freed laterally toward the lateral

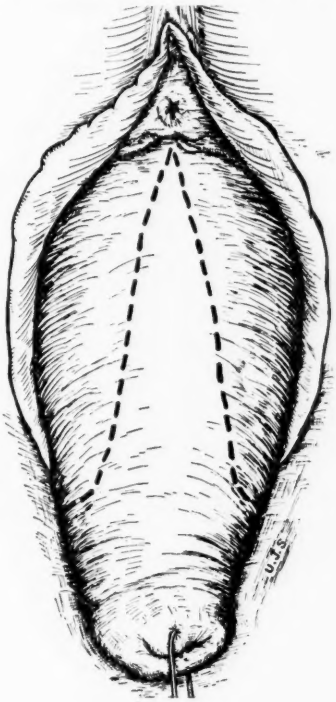

Fig. 1.

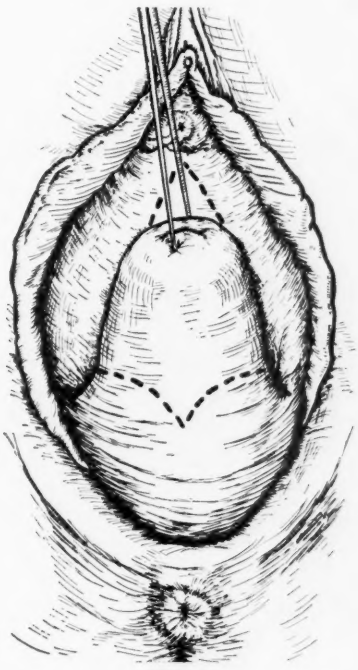

Fig. 2.

Fig. 1.—Anterior triangular incision, starting one-half inch below the urinary meatus.

Fig. 2.—Posterior incision circumscribing the cervix.

fornices, exposing the underlying parametrial tissues and their attachment to the cervix. Posteriorly the mucous membrane is mobilized in a similar fashion, bringing into view the uterosacral ligaments. The parametrial tissues surrounding the cervix at about the level of the internal os are thus exposed on all sides. [Not infrequently during the process of mobilizing the mucous membrane posteriorly the peritoneal reflection of the culdesac is encountered. When small in extent, it is freed from the cervix and pushed upward. When very redundant, to all purposes really an enterocele, the sac is opened, the redundant peritoneum resected, and the opening closed with a purse-string suture attaching the peritoneum to the posterior surface of the uterus above the level of the internal os. This is ordinarily performed after the amputation of the cervix (vide infra)]. The lower margin of the

bladder is then defined by introducing a sound into the bladder. The vesicocervical tissue attaching the bladder to the cervix is incised in the midline and the bladder mobilized in the midline in an upward direction. The pubocervical fascial bands (bladder pillars) usually stand out clearly at this point. It is important at this juncture to free the bladder widely in the lateral directions from beneath the pubocervical tissues. This step is particularly important in the cases where there is a large cystocele.

Fig. 3 portrays the bladder freed from its attachment to the cervix and the bladder pillars defined. The bladder pillars are then ligated and severed from their attachments to the cervix on each side. Not infrequently the descending branch of the uterine artery is exposed lying in the tissues underneath the severed bladder pillars. This artery is ligated as indicated in Fig. 4.

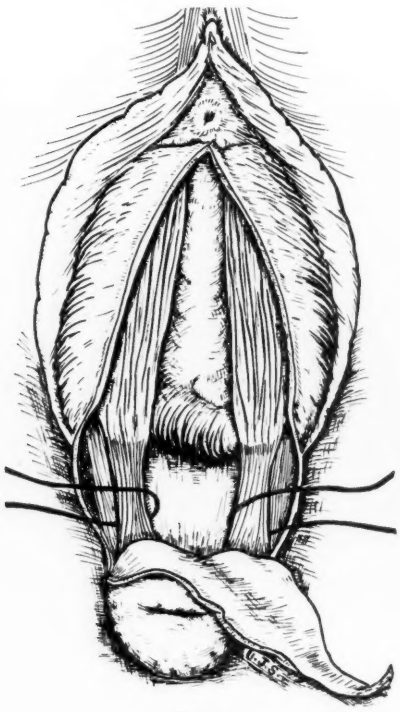

Fig. 3.

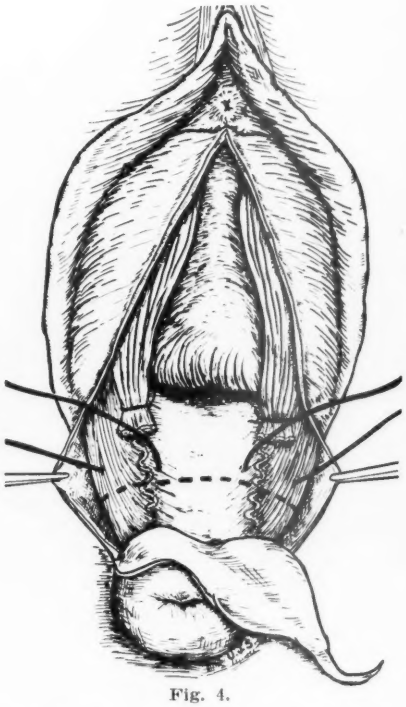

Fig. 4.

Fig. 3.—Triangular mucous membrane flap dissected free. The bladder is freed in the midline from its attachment to the cervix and mobilized in an upward direction. Pubocervical bands (bladder pillars) are then ligated.

Fig. 4.—Pubocervical ligaments ligated and cut, exposing the cervical branches of the uterine arteries. The base of the cardinal ligament on each side is exposed and the vessels are ligated as indicated together with the parametrial tissue close to the cervix. Level of amputation indicated by interrupted line.

In cases of complete prolapse where the parametria are unusually lax, the cardinal ligaments are ligated and severed from their attachment to the cervix at the same time that the vessels are tied. This ligation of the base of the parametria is done only in those cases in which the prolapse is of such extent that the parametria (with traction on the cervix) descend for a distance of one or more inches beyond the introitus. In the average case, however, of first- and second-degree prolapse, ligation of the parametria is not necessary.

Amputation of the cervix is then performed distal to the point of ligation of the vessels. In cases of complete prolapse where the cardinal ligaments have been ligated, the amputation is performed at a high level, immediately below the point of ligation of the parametria (Figs. 4 and 5).

In Fig. 5 are shown the ligated parametria and vessels on each side with the cervix amputated. At this point an anterior colporrhaphy is performed, according to the technic described by Frank,[9] to correct the cystocele. The pubocervical ligaments are approximated with a No. 3 chromic suture which is passed transversely through the anterior wall of the cervix in the midline. In cases of third-degree prolapse where the cervical amputation is performed very high, this suture is passed through the anterior wall of the uterus. The pubovesical fascia is sutured in the midline with interrupted chromic sutures.

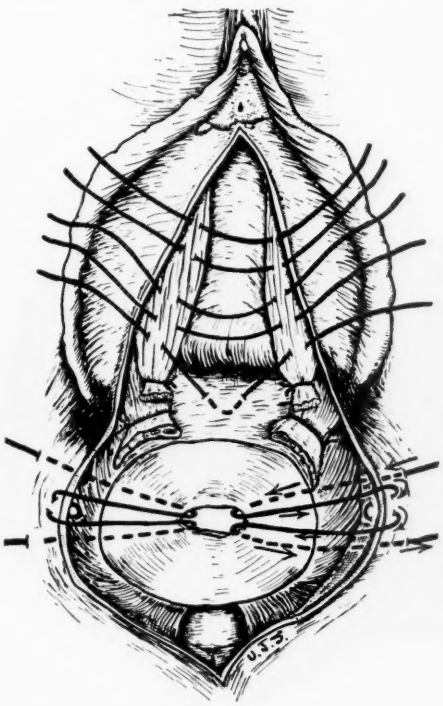

Fig. 5.

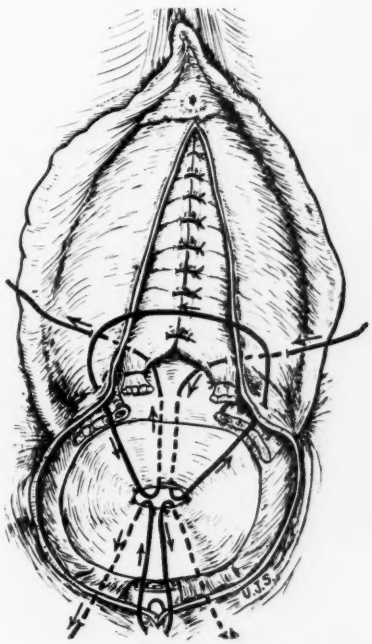

Fig. 6.

Fig. 5.—The cervix has been amputated. The cystocele is repaired by suturing the pubocervical fascia as shown. The lateral parametrial fixation sutures are passed as indicated.

Fig. 6.—The anterior fixation suture is shown traversing mucosa, pubocervical ligaments, and cervix. The posterior fixation suture as illustrated includes mucous membrane, uterosacral ligaments, and cervix. (In order to avoid confusion the lateral fixation sutures are not shown in this illustration.)

The lateral parametrial fixation sutures are then introduced, one on each side, as illustrated in Fig. 5. This suture is started in the mucous membrane of the lateral fornix at a distance of approximately one and one-half inches from the cut edge. The suture is carried through the base of the cardinal ligament and through the lateral wall of the cervix, the needle being brought out through the cervical canal. A bite is then taken in the mucous membrane flap close to the cut edge and the suture is then carried through the cervical canal traversing in reverse fashion the lateral wall of the cervix and the cardinal ligament and piercing the mucous

membrane at a distance of about one inch below the point of entry of the suture (Fig. 5). A similar suture is introduced on the opposite side. Posteriorly, as indicated in Fig. 6, another suture is passed traversing in similar fashion the mucous membrane of the posterior fornix, the sacrouterine ligaments, and the cervix.

The last fixation suture to be passed is the anterior one (Fig. 6). It is started by passing the needle through the lower part of the left anterior flap of mucosa at a distance of approximately one and one-half inches from the cut edges. The lower end of the unattached left pubocervical ligament is grasped and the needle is made to penetrate the cervix, close to the midline at a distance of about one to one and one-half inches proximal to the amputated surface of the cervix. The suture is brought out through the cervical canal and then pierces the deep surface of the mucous membrane flap close to its edge, at the point of junction of the vertical and horizontal edges of the flap. The suture is then carried across the

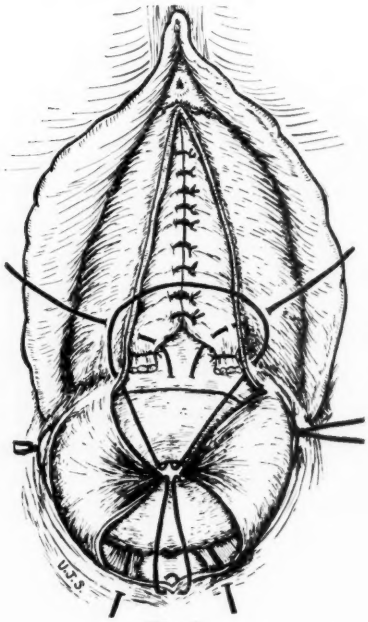

Fig. 7.

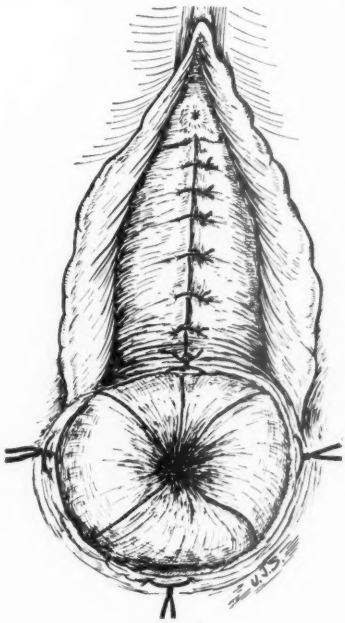

Fig. 8.

Fig. 7.—The lateral parametrial fixation sutures have been tied, resulting in inversion of the lateral mucous membrane flaps.

Fig. 8.—The anterior and posterior fixation sutures are tied and the anterior mucous membrane flaps are then sutured. When completed, the stump of the cervix becomes retracted out of view in the original vault.

midline to the flap on the opposite side and the mucous membrane is traversed from its external surface close to its edge at a point corresponding to the left side. The needle is then introduced into the cervical canal, the anterior wall of the cervix is pierced at a point close to the midline (about one-half inch to the right of the point at which the cervix was penetrated by the entering suture). The suture then picks up the lower end of the right bladder pillar and is passed through the undersurface of the right mucous membrane flap at a distance of about one and one-half inches lateral to the cut edge and an equal distance from the lower edge.

The lateral sutures are then tied. This causes the mucous membrane flaps as well as the lateral parametria to be turned in toward the cervical canal (Fig. 7). The posterior and anterior sutures are then tied in the order named. This results

in complete covering of the amputated cervix with mucous membrane. The lateral flaps of mucous membrane of the anterior vaginal wall are now sutured (Fig. 8). A narrow strip of iodoform gauze is inserted into the cervical canal. A posterior colporrhaphy is then performed. The vagina is packed with iodoform gauze.

In the cases with urinary incontinence, a modification of the Kelly urethroplasty is performed at the time of the anterior colporrhaphy.

STATISTICAL STUDY

Age.—The ages varied from twenty-one to sixty-nine years, the average being forty; 11 patients were under thirty. Eighty-nine of the patients had passed the menopause. (Eight had had antecedent abdominal hysterectomies.) No significant abnormality in the menstrual histories was noted.

Classification.—First degree prolapse: Patients in whom the cervix, on straining, descended to the introitus. Second-degree prolapse: Where the cervix protruded for a distance of at least one and one-half inches beyond the introitus. Third-degree prolapse: Where there was complete descent of the uterus and the fundus, on straining, could be felt at the introitus or below it.

The series consists of 126 cases of first-degree prolapse, 85 of second degree, and 35 of third degree. There were 8 cases of complete prolapse of the cervical stump (posthysterectomy).

The size of the cystocele and rectocele in the individual cases varied widely. The technic, however, was not varied significantly except in 4 cases complicated by the presence of enterocele.

In 2 cases uterine myomas were removed at the same time and in 15 the fallopian tubes were ligated through the vaginal route.

Previous Operations.—Nineteen patients had had antecedent operations for prolapse: anterior and posterior colporrhaphy combined with ventrofixation, 7 cases; anterior and posterior colporrhaphy, 9 cases; interposition and colporrhaphy, 2 cases; hysteropexy and the Polk repair, 1 case. All of these patients had marked prolapse in addition to cystoceles and rectoceles. (In four cases the prolapse was of the third-degree type.) It was difficult to ascertain the exact pelvic status before the primary operation since only 2 of these had been performed at the Mount Sinai Hospital.

There were 8 cases of prolapse of the cervical stump following supracervical hysterectomy for fibroids. In all of these there were, in addition, large cystoceles and rectoceles with almost complete eversion of the vagina.

PREOPERATIVE PREPARATIONS

Patients with extensive cervical erosions or ulcerations of the vaginal mucosa were kept in bed with the cervix and uterus replaced until the ulcerations epithelialized. In a few instances it was found necessary to keep the patients in bed for two weeks before sufficient healing occurred to permit operation. In patients after the menopause, administration of an estrogenic preparation* seemed to promote more rapid healing of the vaginal ulcerations.

Urine concentration tests and phenolsulphonephthalein excretions are done routinely. In the cases of the third-degree prolapse, intravenous urography is performed to determine the status of the kidneys.

In every case a photograph is taken of the prolapse before operation and incorporated in the patient's clinical chart. This makes possible accurate evaluation of the result of the operation when the patient is examined in the follow-up clinic at a later date.

Anesthesia.—Inhalation anesthesia of nitrous oxide and ether was employed with the usual atropine and morphine premedication.

POSTOPERATIVE CARE

The patients are kept on a fluid diet for four days. During the first forty-eight hours ⅙ gr. of morphine is given whenever necessary. Thereafter mm XX of deod. tinct. of opium is given three times daily.

It is of prime importance to keep the bladder empty. This is accomplished by catheterization every six hours and, if necessary, at shorter intervals. The majority of the patients begin to void after four or five days. At this point catheterization for residual urine should be done. Occasionally patients find it impossible to void for ten and even twelve days. Such patients have no difficulty in voiding as soon as they are out of bed.

On the night of the fourth postoperative day cascara gr. X is given, followed at 6:00 A.M. the next morning by 6 ounces of magnesium citrate. Four hours later the patient is given a soapsuds enema and the packings are removed. The patients are allowed out of bed on the fourteenth day and are discharged usually the next day.

The above technic was employed in 254 ward cases of uterine prolapse. This includes additional follow-up on the 106 cases reported by Frank in 1935.

Complications.—Two of the patients developed secondary hemorrhage from the anterior colporrhaphy suture line, one on the ninth and one on the thirteenth postoperative day. One patient developed a phlebitis of the internal saphenous vein. One patient, six weeks after the operation, developed a pyometria which was drained through the cervix.

Mortality.—There was no mortality in this series.

RESULTS

The importance of frequent follow-up examinations over a period of several years, in order to judge properly the results of a surgical procedure for the cure of prolapse, is self-evident. In this series the patients were examined every three or six months during the first year after the operation, and at six-month intervals thereafter. The period of follow-up observation varied from three months to five years. The routine practice of having a preoperative photograph on every chart is very helpful to the examiner in the follow-up clinic, since it permits of an accurate comparison of the preoperative with the postoperative status.

PERIOD OF FOLLOW-UP	NUMBER OF CASES
4-5 years	12
3-4 years	36
2-3 years	54
1-2 years	76
6-12 months	30
3-6 months	46

In evaluating the results of the parametrial fixation operation, both anatomic and functional criteria were kept in mind.

*We are indebted to the Schering Corporation of Bloomfield, N. J., for Progynon-B employed for this purpose.

Anatomic factors considered were: (1) the presence or absence of descensus of the cervical stump and vault of the vagina with the patient straining in the lithotomy position; (2) descensus of the anterior and posterior vaginal walls.

The functional factors noted were: (1) the presence or absence of a sensation of descensus or of vaginal protrusion; (2) the functional status of the vagina; and (3) general symptomatic result.

As regards the prolapse, the results were surprisingly uniform. With but one exception, the prolapse was cured in the entire series. The findings in these cases, whether one examined them three months or five years after the operation, are strikingly similar. The cervix is usually felt flush with the fornices and on straining there is practically no descent either of the cervix or of the vaginal vault. The most striking results were noted in the cases that had had complete uterine prolapse with large cystoceles and rectoceles (and in a few cases also enteroceles). The results in this group were as good as in the group of first- and second-degree prolapse.

In the entire series of 254 cases there was one case of recurrence of the prolapse. This was in an asthenic patient aged forty-seven, ten years after the menopause, with a third-degree prolapse and a history of vaginal protrusion of eighteen years' duration. Signs of recurrence were noted three months after the operation. This was the patient who developed a pyometria six months after the operation.

In 15 cases there was considerable sagging of the anterior vaginal wall, but even in these the cervical stump and fornices remained high up on straining. In two of this group there was a recurrence of the cystocele which required a secondary anterior colporrhaphy; one case required a secondary repair for recurrence of the rectocele. One of these cases had required revision of the anterior colporrhaphy because of secondary hemorrhage on the ninth postoperative day which may account for the recurrence of the cystocele.

The parametrial fixation procedure was put to its severest test by the series of cases of recurrent prolapse (following interposition, ventrofixation, etc.) and by the group of 8 cases of prolapse of the cervical stump occurring after supracervical hysterectomy. This group of cases presented complex surgical problems because of the antecedent operations and constituted a genuine challenge to the parametrial fixation operation. The uniformly excellent results in this group, particularly in the two cases of recurrent third-degree prolapse, following unsuccessful interposition operation and in the cases of complete cervical stump prolapse, were very gratifying.

It is interesting to note that not infrequently there was a discrepancy between the anatomic result as viewed objectively by the examiner and the functional result from the patient's point of view. In the majority

of the cases in which sagging of the anterior or posterior vaginal walls was noted the patients had no complaints. Apparently the anatomic criteria employed for perfect anatomic restitutio as estimated with the patient straining in lithotomy were more rigid and theoretical than is required for a good clinical (subjective) result.

In 8 cases the patients complained of dyspareunia. In all but 2 of these the dyspareunia grew progressively less bothersome after the first year. Several of the patients were given graded dilatations with vaginal dilators. In one case the vagina was constricted by a fibrous band which responded to vaginal dilatation. In another in which dyspareunia was caused by a narrowed introitus the condition was corrected by incising the perineum in the midline and resuturing in the opposite direction.

As regards the subjective (functional) results, these were considered very good except in the small group of 8 cases that had dyspareunia, the one case of recurrent prolapse, and the 2 cases with recurrent cystoceles, and the one with recurrent rectocele which required secondary colporrhaphy. Many of the patients volunteered the information that one of the most gratifying results of the operation was the disappearance of vaginal discharge which had apparently originated from the chronically infected, lacerated cervix.

During the course of five years of observation of these cases, one becomes impressed with the fact that as time goes on there is a definite progressive improvement in both the anatomic as well as functional status.

RELATIONSHIP TO PREGNANCY AND PARTURITION

The English schools are of the opinion that the Manchester operation is no contraindication to pregnancy and that labor is not significantly complicated by the operation. It has been the feeling here, however, that pregnancy is preferably to be avoided. Accordingly, the patients who still menstruate are referred for contraceptive instruction. Of late it has become the practice to ligate the fallopian tubes through the vagina in the appropriate cases at the time of the parametrial fixation operation.

In this series 2 patients became pregnant and had uncomplicated labors. One patient was thirty-nine years of age, gravida iii, para ii, had had a second-degree prolapse and became pregnant six months after the parametrial fixation operation. The labor was uneventful. When seen four months after delivery, there was no sign of recurrence of the prolapse. The second patient was thirty-two years of age, gravida xii, para viii, had had a second-degree prolapse and became pregnant fifteen months after the operation. Labor was uncomplicated and when examined four months later, the cervical stump and vaginal walls were found not to descend on straining.

SUMMARY

1. The technic of the parametrial fixation operation is described in detail and the results in a group of 254 cases are reported.

2. This series consists of 126 cases of first-degree prolapse, 85 of second degree, 35 of third degree, and 8 cases of prolapse of the cervical stump occurring after supracervical hysterectomy for fibroids.

3. The operation has the following advantages over other surgical procedures employed for the cure of prolapse, namely:

a. High percentage of cures.
(there was one case of recurrence in a series of 254 cases; 99.6 per cent cures).
b. Low morbidity and mortality.
(mortality in this series—0).
c. The operation is entirely vaginal.
d. It does not necessitate the removal of the uterus.
e. The function of the vagina is not compromised.
f. The operation does not preclude the possibility of subsequent pregnancy and uncomplicated labor.
g. If necessary, the fallopian tubes can be ligated at the same time, per vaginam.

4. The practice of taking preoperative photographs in every case of prolapse and a thorough follow-up system consisting of examinations at three- to six-month intervals for periods up to five years permitted of precise evaluation of the results of the operation in this series.

5. The procedure has given as good results in cases of complete as in cases of first- and second-degree prolapse.

6. The operation has given excellent results in cases of prolapse of the cervical stump occurring after supracervical hysterectomy.

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Browne, F. J.: Maternity Services: The Part Played by Education of Medical Students, Brit. M. J. **2**: 384, 1936.

From answers to a questionnaire sent to medical schools in Great Britain and Northern Ireland the author concludes that better obstetric service can be obtained only by better undergraduate and postgraduate training of medical students. He points out channels for improvement in clinical experience and practical ways for the training of undergraduates and the general practitioner.

Clinical instruction should not aim at making the student an obstetric expert. The instructors should be men whose main interest is obstetrics and who give to it their whole time, reside in the hospital and have an adequate staff.

F. L. Adair and S. A. Pearl.

GONORRHEA IN THE FEMALE TREATED BY A COMBINED HEATING TECHNIC

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THE fact that the gonococcus is a thermolabile organism which can be destroyed at temperatures tolerable to the human body has led investigators to use various temperature elevating procedures in the effort to destroy this organism within its human host.

Carpenter and his coworkers[1] have reviewed the thermal resistance of numerous strains of the gonococcus. They have found that at 41.5° C. (106.7° F.) these strains will survive heating for different periods varying from six to thirty hours. The upper limit to which the temperature of the entire human body may be raised with reasonable safety is approximately 41.5° C. Continuous exposure of the infected patient to heating procedures sufficient to maintain this systemic temperature for the long periods necessary to exert a thermolethal effect on all of the gonococci in one session is extremely trying both to the patient and to the attending medical staff. We have found that the temperature of the female pelvic organs can be elevated to a considerably higher level (42.8° to 43.3° C. or 109° to 110° F.) for a period of about eight hours. These higher temperatures destroy the gonococci lodged within the pelvic organs in a much shorter period of time than that required at a temperature of 41.5° C. (106.7° F.). In order to maintain these high pelvic temperatures, it is necessary to elevate the temperature of the entire body at the same time.

We have previously described the various technics which we have employed during the past six years.[2-5] The procedure which we now follow is first to elevate the systemic temperature by short wave currents while the patient lies in a cabinet heated by electric lamps (Fig. 1). After the systemic temperature has been elevated to about 41.1° C. (106° F.), we apply the additional local heating to the pelvis, principally by means of diathermy, supplemented for an hour or two by ultrashort wave. At the same time the systemic temperature is maintained at its elevated level.

We use special vaginal electrodes channeled to permit the insertion of a thermometer[6] (Fig. 2). These electrodes were patterned after casts of the vagina made from living subjects. They are available in four lengths varying from 2¾ inches to 4¼ inches. The electrodes have a relatively large surface area, and no sharp edges, which if present might cause a concentration of current and local overheating of tissue. It is important to use an electrode of proper length in the treatment of each patient, if the urethra as well as the cervix is to be included in the field of high

local temperature elevation. In patients with lacerated perineum, a special electrode support may be necessary to hold the electrode in contact with the urethra.

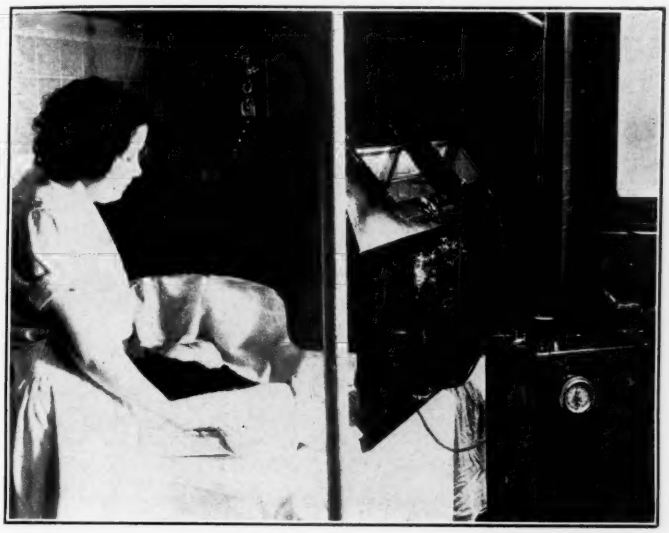

Fig. 1.

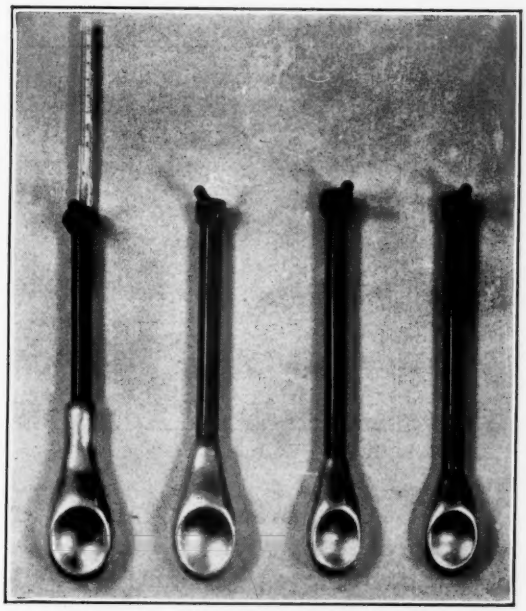

Fig. 2.

The vaginal electrode is connected to one terminal of the diathermy machine. The other terminal is connected to three belt electrodes made of Crooks metal. One belt is placed around the waist, and one around

each thigh just above the knee (Fig. 3). An additional diathermy plate placed in contact with the back has its lower end tucked under the posterior portion of the abdominal belt (Fig. 4). The amount of current required is determined by the temperature reading of the thermometer in the vaginal electrode. Usually it does not exceed 2500 milliamperes, as indicated by the meter on the machine. After three hours, the metal

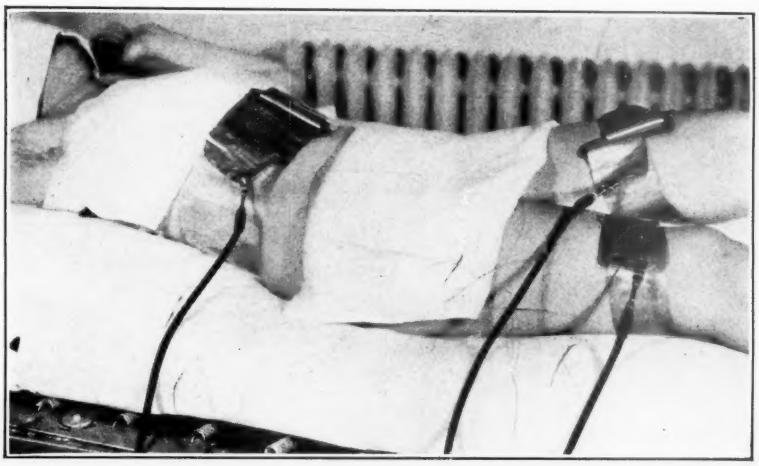

Fig. 3.

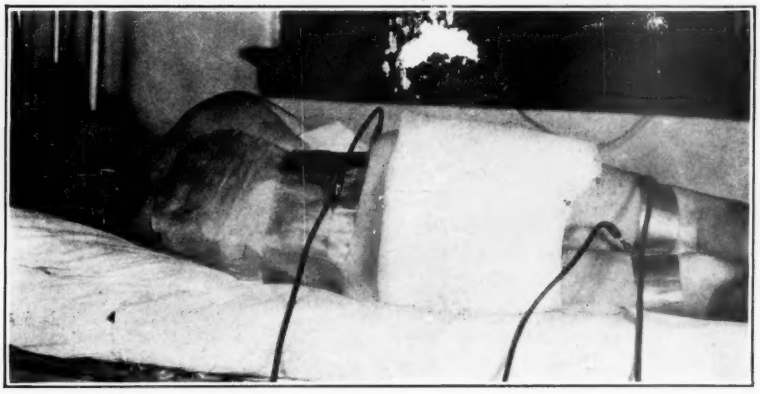

Fig. 4.

belts about the thighs are transferred to the calves of the legs, this arrangement being employed for three or three and one-half hours (Fig. 5). After this, the diathermy belts are all removed.

An additional hour or two of pelvic heating may be given by short wave, using the same vaginal diathermy electrode. The vaginal electrode is connected to the short wave machine by a cable in the course of which a small variable condenser is placed. The condenser plate from the other side of the apparatus may be placed outside the fever cabinet, either

under or over it. This airspacing arrangement is possible only with machines of relatively short wave length. We use an apparatus producing current of six meter wave length.

The multiple dispersive diathermy electrodes are necessary because of the poor tolerance of the subcutaneous fat to prolonged heating by diathermy. With dispersive electrodes which do not have a sufficiently large area of contact, prolonged diathermy treatments may be followed by the formation of painful indurations under the skin covered by the electrodes. The shifting of the diathermy belts at the end of three hours of treatment, from the lower thighs to the calves, was found necessary for the same reason, namely, that with the belts in place about the thighs throughout, induration sometimes occurred under the areas which had been covered by them. Even with the arrangement which we employ,

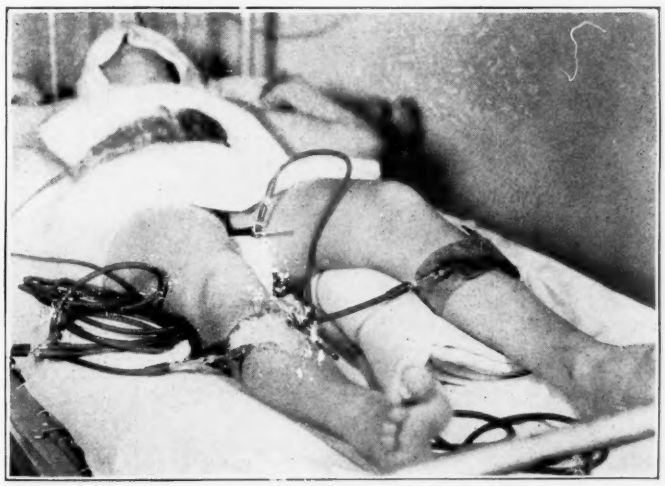

Fig. 5.

in several cases there have been evidences of overheating of the thighs. This is more likely to occur if the thigh belts have been placed closer to the inguinal region than to the region of the knee. In such cases, on the day following treatment, patients have complained of pain in the inner aspect of each thigh, aggravated by abduction of the thighs. This pain has lasted for only a few days in most cases, but in three instances persisted for a week or two. Upon examination, in addition to the tenderness, we have noted some swelling of the upper inner thigh. This swelling disappears with subsidence of the pain.

The use of short wave currents instead of diathermy in a number of cases throughout the six- or eight-hour period of pelvic heating, was followed by painful thighs and backache in a much higher percentage of those treated, than with our routine diathermic method. We, therefore, consider diathermy our mainstay for pelvic heating, utilizing pelvic

short wave only for a brief supplementary period in some cases. The fact that short wave treatment was followed by painful thighs suggests that heating of the retroperitoneal muscular, vascular, or nervous tissues may be the cause, since the dispersive condenser pad was never in proximity to the thighs.

Patients are encouraged to eat a hearty meal the evening before, but on the morning of the treatment, breakfast consists only of tea and toast or crackers and milk. An enema is given about an hour before the administration of the treatment, which is usually started at about 7 A.M. The lower extremities are wrapped in cotton to avoid skin damage from the heat of the cabinet. We have found that the preliminary hypodermic administration of hyoscine and morphine (hyoscine hydrobromide gr. $\frac{1}{200}$, morphine sulphate gr. $\frac{1}{6}$) makes the patient more comfortable and also usually facilitates the elevation of temperature because of the interference with sweating. Later, if necessary because of restlessness, additional doses of morphine ($\frac{1}{8}$ gr.) or of hyoscine ($\frac{1}{400}$ gr.) may be given at intervals. These sedatives are administered guardedly so as to avoid undue depression of the respiratory center. It is a common experience to observe an elevation of temperature following the administration of a sedative to the hyperthermic patient. If necessary, this is counteracted either by diminishing the amount of heating energy applied to the patient or by increasing heat loss.

The patient is permitted to drink as much as she desires, of either plain water or a 0.6 per cent saline solution. A cold towel placed on the forehead frequently helps to make her more comfortable. As a result of sedation, patients may doze for considerable periods of time.

During the period of pelvic heating by diathermy or short wave, the rectum is also heated additionally. Its temperature, therefore, does not indicate the true systemic level. The systemic temperature is, therefore, determined at intervals of five or ten minutes by means of thermometers placed under the tongue and in the axilla. These temperatures, as a rule, are not permitted to go above 40.8° C. (105.5° F.). We have found it of value in each case, as soon as hyperpyrexia has been produced and before distortion due to pelvic heating occurs, to establish the relationship between the systemic temperature as indicated by the rectal thermometer, and the temperature in the mouth. As a rule, the mouth temperature is about 0.7° F. (0.4° C.) lower than the rectal temperature. However, it may occasionally be 2.0° F. (1.2° C.) lower, and sometimes it may be the same as or slightly higher than the rectal temperature.

Observations must be made not only of the systemic and vaginal temperatures, but also of the patient's general condition, her color, the character and frequency of respiration, and the pulse. A pulse rate beyond 160 beats per minute calls for a lowering of the systemic temperature or the complete cessation of treatment.

The treatment is an uncomfortable one, but there is no pain. There is a definite element of danger if care is not taken to make certain that the systemic temperature does not exceed 41.7° C. (107° F.). Continuous watchfulness is necessary. There has been no fatality and no serious complication in any of our cases.

We believe that this treatment is indicated at any stage of gonococcal infection in the otherwise healthy adult female. Patients with organic disease, which would make them poor surgical risks, should not be treated. Pregnant women with gonorrhea should not be treated because of the likelihood of harm to the fetus from the high pelvic temperatures.

Early in our experience a patient was treated during menstruation and developed evidences of salpingitis the next day. Since then, we have refrained from treating any patient during the two days prior to the expected onset of menstruation, during the period, and for two days after the cessation of flow. Other than in the patient just referred to, there has been no instance of extension of the infection in any patient who has received this therapy, even in those cases in which the first treatment did not eradicate all the gonococci.

By means of this combined heating technic, we have treated 121 women, in all of whom the presence of the gonococcus had been determined in either the cervical or the urethral secretion or in both. Of this number, our first series of 67 patients received treatments combining about six hours of systemic fever with about three and one-half to four hours of additional pelvic heating. Of this group, 62 were rendered gonococcus-free in an average of 2.4 treatments per patient. In the five failures the patients received from one to three treatments. Further treatments were not administered for various reasons.

Fifty-four patients were treated in our subsequent series. These patients were subjected to periods of systemic temperature elevation varying from ten to fourteen hours, during six to eight of which additional pelvic heating was administered at a temperature of about 42.8° to 43.3° C. (109° to 110° F.). Fifty-one of these patients became gonococcus-free after an average of 1.4 treatments per patient. None of these patients received more than three treatments. Of the three failures in this group, two received one treatment each, after which their smears remained positive. We did not have the opportunity of retreating these two cases. The third patient received four treatments, in spite of which, gram-negative intracellular diplococci could still be demonstrated in smears from the urethra, although the cervix had become negative. We believe that in this instance the organisms were unusually heat-resistant.

The day after treatment, smears are examined and if found still positive, the treatment is repeated on the following day. Once the smears have become negative, examinations are performed each day for several days, then at longer intervals. Treatment is repeated at once if gonococci are again found. Whether a patient will require one, two,

or three treatments depends upon the resistance to heat of the gonococci responsible for her infection, and, to some extent, upon her own resistance to the gonococci. The adequate "heat dosage" in each case is determined by the disappearance of gonococci, and it is only when the gonococci have permanently disappeared that we obtain the therapeutic results to be described.

Within a few days following adequate treatment, there is a subsidence or disappearance of the vaginal discharge. The cervical secretion becomes mucoid and clear, microscopically containing only scattered leucocytes instead of the pus clumps previously found. The urethral smear contains only scattered leucocytes in addition to many epithelial cells and Döderlein bacilli. In a few cases, superficial mucosal burns have caused a prolongation of the discharge. With the healing of the mucosal area within two or three weeks, the discharge disappears. In a few other cases, trichomonas vaginitis has caused a continuation of the discharge following disappearance of gonococci. This discharge ceases with the application of measures aimed against the vaginitis.

About one-third of the cases were complicated by salpingitis. In the acute or subacute salpingitis cases, pain usually disappears during the first treatment. We have observed that treatments may be instituted at any stage of gonococcal infection, even in the presence of acute salpingitis, associated with fever and pelvic peritonitis. Tuboovarian inflammatory masses, including those which are probably suppurative and associated with a rapid sedimentation time, respond satisfactorily to this type of treatment. There is first a diminution or disappearance of pain, and a return of the temperature to normal the day following the treatment. The temperature remains normal. Rapid sedimentation rates become slower.

Pelvic examination within a few days after treatment usually reveals a marked diminution of pelvic tenderness, but little change in the size of the adnexal masses. From seven to ten days after treatment there is usually an increased mobility of the uterus and some shrinkage of the inflammatory masses. After about two weeks following the treatment, the adnexal masses become much smaller.

The first menstrual period following treatment sometimes comes on before the expected time and may be more profuse and of longer duration than usual. We have never observed a cessation of menstruation or the occurrence of menopause symptoms after treatment. A number of patients with chronic salpingitis associated with painful or prolonged menstruation, noticed that menstruation became more normal and less painful following treatment.

Pregnancies and normal delivery have occurred in a number of patients whom we have previously treated for gonorrhea by this technic. In a number of patients with acute salpingitis at the time of treatment, insufflation by the Rubin method has subsequently demonstrated normal tubal patency.

The follow-up on most of these cases has been sufficiently prolonged (in some cases extending for a period of five years) to assure us that the disappearance of the gonococci has been permanent. We have relied upon frequently repeated smears, especially those taken directly after the cessation of menstrual flow. In addition, in many cases we have made cultures. The danger of a woman becoming reinfected by resumption of relations with the sex partner who originally infected her or with some other infected individual is always to be reckoned with. In four cases, after intervals of many months, during which repeated examinations failed to reveal the presence of abnormal discharge or of gonococci, a purulent discharge containing the organisms was again found. In each of these cases, there was a definite history of new exposure to an infected partner.

SUMMARY

We have described a method for the treatment of gonorrhea in women which we have developed and used during the past six years in 121 cases, with success in 113 (93 per cent). The treatment is strenuous, and not without danger. It is a hospital procedure. Adequate apparatus, trained personnel, and continuous watchfulness are necessary. Physically induced fever is combined for six hours with pelvic diathermy, and for two hours with pelvic short wave, so as to produce a vaginal temperature of about 109° to 110° F. (42.8° to 43.3° C.), while the body temperature is held between 105.5° and 106.5° F. (40.8° and 41.4° C.) and continued for a period of about twelve hours. While usually one to three such treatments may be required to eradicate all gonococci, the average number found to be necessary in our last series was 1.4 per patient. The special vaginal and body electrodes and their use are described as is also the care of the patient during treatment. Contraindications, immediate, and late results are discussed.

CONCLUSIONS

The outlook for the woman with gonorrhea has been brightened by the development of the combined heating procedure here described. A rapid eradication of the gonococci can be achieved in most cases, and without danger of extension of the disease. The possible dangers of the heat treatment itself require that it be administered in hospitals, and only by those sufficiently qualified by special training and experience.

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AN ANALYSIS OF 521 CASES OF TWIN PREGNANCY

I. Differences in Single and Double Ovum Twinning

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THE term "twin" in this series of papers shall embrace both the single ovum (monozygotic) and double ovum (dizygotic) varieties. Actually it should be restricted to the one-egg type as it is derived from the Anglo-Saxon, "getwinn," and is related to other words of the same root, such as twaining or two-ing, which imply dividing in two. However, its use to describe two born at the same time has been common English practice since the sixteenth century when understanding of the process was of course very vague.

Incidence of all forms of twinning

The 521 cases which form the subject of this study occurred on the combined hospital and home delivery services of The Johns Hopkins Hospital from the inception of its obstetric department in 1896 to Jan. 1, 1937, a period of forty years. During the same period there were 38,496 deliveries of viable children (more than 1,500 gm.) and 2,638 abortions. Among the former were 450 cases of twins, or 1 in every 86.5 viable births, and among the latter 71, or 1 twin abortus in every 37.1 abortions. If the viable pregnancies and abortions be added together and the total cases of twins be divided into this combined figure, we find that one set of twins occurred in every 80 pregnancies.

These figures show striking agreement with those for the whole birth registration area of the United States, where during the five-year period, 1926 to 1930, one pair of twins was recorded to each 86.3 confinements. Since, in the main, abortions are seldom reported, it is likely that the Johns Hopkins figure of 1 twin gestation in every 80 pregnancies would be approximated in the country at large if all abortions were included.

During the same forty-year period there have been 7 triplet pregnancies on the Hopkins Obstetrical Service, 5 of them resulting in children of viable size, a proportion of one set of viable triplets to every 7,699 viable births. The remaining two were abortions, an incidence of one triplet abortus to every 1,319 abortions. If the seven triplet pregnancies be divided into the total pregnancies (viable + abortions) we find an incidence of one triplet pregnancy to each 5,877 gestations.

It is interesting to examine these figures in the light of Zeleny's hypothesis, that if N equals the incidence of twin births in any portion of the

population, the incidence of triplets is N^2, and quadruplets N^3. On the basis of the small Hopkins experience, one would expect viable triplets in every 7,482 (86.5^2) viable births, and triplet pregnancies in every 6,400 (80^2) pregnancies. As a matter of fact the figures were 7,699 and 5,877.

THE DIFFERENTIATION OF SINGLE FROM DOUBLE OVUM TWINS

Two methods have been commonly employed to differentiate single from double ovum twins. The first, the study of the twins themselves, and the second, the study of the placental relations.

Those who rely on the first method make the diagnosis by a physical comparison of the members of a pair. Such an investigation is usually best performed between the ages of two and four years, for at this time differences due to inequalities of intrauterine existence have been diminished by the postnatal months and differences created by external environmental factors have not had the opportunity to become marked. To diagnose a pair as derived from one egg, the following physical criteria must be satisfied:

1. Both members of the pair must be of the same sex.

2. Their features, including ears and teeth, must be obviously alike. This resemblance need in no sense be absolute, since in a way each member of such a pair may be thought to represent but one-half of a single zygote and therefore the twins need not resemble each other more closely than the two lateral halves of one individual. The extent of difference or asymmetry between corresponding parts on the opposite sides of a human being may be relatively marked.

3. Their hair must be identical in color, texture, natural curl, and distribution.

4. They must have eyes of the same color and shade.

5. They must have the same skin texture and color, although nevi may be differently apportioned and distributed.

6. They must have hands and feet of the same conformation and approximately the same size.

7. Certain anthropometric values, cephalic index, forearm to upper arm length, etc., must show close agreement in both members of the pair.

8. They must have very similar finger and sole prints. This resemblance may be direct or mirror-imaged. In the former instance the finger prints of the right hand of Twin A must resemble the finger prints of the right hand of Twin B more than finger prints of A's right resemble those of his own left. If the resemblance be mirror-imaged or contralateral then the finger prints of A's right hand must resemble B's left more than they do his own left.

The phenomenon of mirror-imaging in single egg twins is in itself an interesting chapter. The pairs who show it in the configuration of their dermal ridges are likely to show opposite hair whorl, one being clockwise, the other counterclockwise. This mirror imaging may involve deeper structures. In 48 per cent of pairs of single egg twins one member is left handed, the other right handed. Congenital defects and neoplasms are frequently reported mirror-imaged in single egg twins.

Double ovum twins of course show no higher incidence of similarities than any ordinary brothers or sisters at the same age, and left handedness is one member of a pair is no higher than in the population at large (4 per cent).

Many biologists oppose the differentiation of single from double egg twins on the basis of physical similarity or nonsimilarity. They argue that it is fallacious to assume the cause of a thing purely by its result, particularly if the result is sometimes equivocal. They contend that it is very difficult and often impossible to distinguish with assurance those monozygotic twins which are least similar from like-sexed dizygotic twins which bear a very strong sibling resemblance.

The second method of differentiation, that of placental relations, has been used for many years. It is assumed that if the embryos arise from two eggs they either have separate placentas or a fused single placenta with a four-layer partition wall, the amnion and chorion of Twin A in contact with the chorion and amnion of Twin B. This can be determined grossly by peeling apart the four separate layers. Occasionally the two chorions are so adherent that there appear to be but three layers, the fused chorionic membranes sandwiched between the two amnions. On the other hand, if the twins are derived from one egg, only two layers of amnion form the partition wall. Occasionally a double ovum three- or four-layered partition wall may be confused with this two-layered single ovum condition, so that it is safer to check each supposed single ovum specimen by microscopic sections.

In recent years Siemens,[1] Curtius,[2] Von Verschuer,[3] and others have challenged the reliability of the membranes as an absolute criterion of single ovum or double ovum twinning. The first two authorities claim that a four-layered partition wall may in some instances be present in one egg twinning. In such an instance the egg divides when still a young morulla, for example, when it is in the 8 or 12 cell stage. At this early phase no embryo and no anlage of a placenta is present, the cells are still omnipotential, and when the egg divides two separate placentas and embryos are formed. It is assumed that the usual single egg twinning occurs after the morulla has developed into a blastocyst and that the fission involves only the embryonic area. The blastocyst wall, the primitive chorion which surrounds it, is not involved. Siemens and Curtius compared the physical identity of several pairs of twins many months after birth and found that some obviously identical pairs were reputed to have had even separate placentas at birth.

Von Verschuer reported an instance of the reverse condition, twins who had a single ovum placenta, but whom he considered dizygotic or double ovum on the basis of their physical comparison. He suggests the possibility that the two originally separate chorionic cavities became con-

tinuous owing to the obliteration of the two adjacent chorionic walls which at first separated them. The mechanism for such a phenomenon is difficult to imagine.

In summary then, certain biologists claim that the physical comparison of a pair of twins is the only certain method to discriminate between monozygotic and dizygotic types. On the other hand others assert that the placenta is the most reliable criterion.

EVIDENCES OF A FUNDAMENTAL DIFFERENCE IN THE BIOLOGY OF SINGLE AND DOUBLE OVUM TWINNING

The consideration of the mechanism involved in single ovum and double ovum twinning suggests forcibly that they represent very separate biologic phenomena: the one fission of either the morulla or the embryonic area; the other the ovulation and fertilization of two ova within a short space of time. The first process is true twinning or "twaining," the other merely the conception of a litter of two.

In 1934, with this concept in mind, William Walter Greulich,[4] one of the American authorities in the field of human twinning, investigated the relative importance of heredity in the production of both single and double ovum twins. The type of twin was differentiated solely by the method of physical comparison, the placental relations being unknown. He studied the parental stock of 366 pairs, 93 of which (25.4 per cent) appeared definitely monozygotic. Greulich found that "the parents of monozygotic twins differed from the parents of dizygotic twins in their capacity for twin production: the latter had twins much more frequently than would be expected if twinning were determined by chance alone, while the former showed a frequency of twin births only very slightly higher than the chance expectation." This tendency of excessive twin production by the parents of dizygotic twins was shared by other members of the parents' families: brothers, sisters, parents, aunts, and uncles, while the near relatives of the parents of monozygotic twins showed no such proclivity.

Greulich also analyzed the age distribution of the mothers at the time of the birth of the 273 pairs of dizygotic and the 93 monozygotic twins, and compared each with the frequency curve of the delivery age distribution of six million mothers. He found that the age distribution of the monozygotic producing group was approximately the same as that of the six million, but the dizygotic mothers had an appreciably older age distribution. On the basis of these data he writes: "If monozygotic and dizygotic twinning were merely different expressions of the same twinning tendency, the former manifesting itself more readily in younger mothers than the latter, one would expect the curve of the one to rise proportionally as that of the other falls. Such, however, is not the case, both curves tending more to parallel each other, with each having a dif-

ferent mode. This suggests that monozygotic and dizygotic twinning are phenomena distinct from each other as regards most, or all, of their causative factors.''

We thought that it might be valuable to analyze similarly a large series of twin births divided into monozygotic and dizygotic groups on the basis of placental relations and compare the findings with Greulich's. If the results were similar, it would be presumptive evidence that either method, namely, the physical comparison of the twins themselves or their placental relations, is satisfactory for distinguishing between single and double ovum twins.

THE MATERIAL

As we stated previously 521 cases of twins occurred from 1896 to 1937 on the Obstetrical Service of the Johns Hopkins Hospital. In most instances the placenta was carefully described and when any doubt existed as to whether it was a single or a double ovum organ, the partition wall was subjected to microscopic study. Until his death in 1931 most of the specimens were examined by J. W. Williams. For some reason or another the placental examination was not completely trustworthy in 43 cases, so that they had to be excluded from the portion of this study which depends on differentiating single from double ovum specimens. In 478 cases the placental relations were accurately described. Of these 478 cases, 123 were single ovum and 355 double ovum. The proportion found to be monozygotic on the basis of the membranes shows almost embarrassing agreement with the findings of Greulich derived from the physical comparison of twins themselves. Our series showed 25.7 per cent derived from one egg, and Greulich's, 25.4 per cent.

EFFECT OF RACE

The material of The Johns Hopkins clinic is almost equally divided between the black and white races (52.25 per cent black and 47.75 per cent white), so that it seemed unusually well suited for determining whether twinning is more common in one race than the other. There was 56.4 per cent of the twinning in black patients, and since this is only 4 per cent above expectancy, it is likely that the difference is owing to a sampling error and that race is not a significant factor; 57.7 per cent of the dizygotic specimens came from colored patients and 52 per cent from the monozygotic.

RECURRENT TWINNING IN THE MOTHERS OF MONOZYGOTIC AND DIZYGOTIC PAIRS

We thought that some light might be thrown on the biology of the two forms of twinning by determining whether recurrent twinning occurs with equal or different frequency in the two groups. Of the 478 patients, 30 gave the history of having had twins in a previous pregnancy. Of the 30 who gave this history, 28 (93.3 per cent) delivered

double ovum specimens. Fifteen additional patients of the series were delivered of twins in a subsequent pregnancy. Of these, 14 (93.3 per cent) had double ovum specimens at the time of their initial twin delivery. Thus of the 45 cases demonstrating recurrent twinning, 42 were associated with the double ovum variety and only 3 with single ovum twinning.

Unfortunately, our histories did not stress the presence or absence of twinning in near kin, so that we cannot compare the conclusive findings of Greulich in this respect to our own. However, combining his results with ours it seems safe to conclude that double ovum twinning is a definitely inherited specific condition which is likely to recur. Single ovum twinning appears to be a biologic sport which happens by chance and has little tendency to reappear.

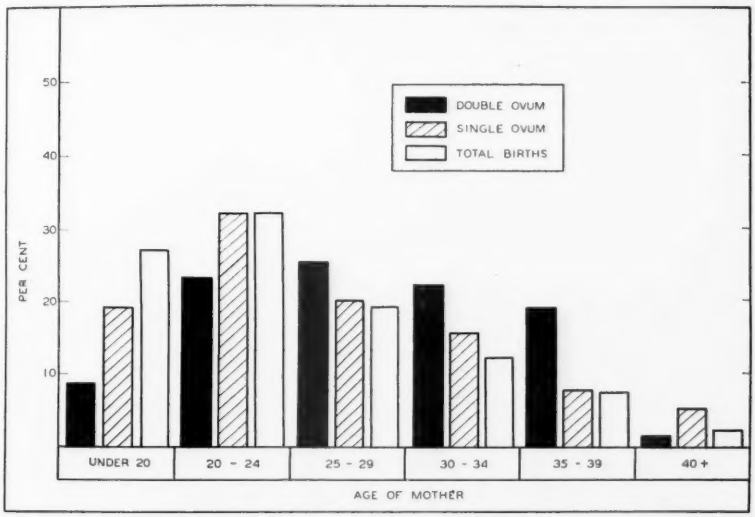

Fig. 1.—473 dizygotic and monozygotic twin-bearing mothers divided into the different age groups and compared with the age distribution of all patients admitted to the obstetrical clinic. For example, the first three columns show that 9.3 per cent of all the dizygotic twins were born to mothers of less than 20 years of age and 18.5 per cent of all the monozygotic, while 27.1 per cent of the total obstetrical clinic population were less than 20 years of age.

AGE OF THE PATIENT

The results of this portion of our survey are recorded in Table I and graphically illustrated in Fig. 1. It seems quite obvious from these data that single ovum twinning occurs with almost the same frequency as the total births for the various age periods. There is a minor tendency to shift from the lowest age group to the older ones. It is significant that by far the most common age group for single ovum twinning is the group (20 to 25) in which the greatest number of total births occurred. On the other hand dizygotic twinning is fundamentally a function of the older age brackets.

In Fig. 2 we have compared our findings for the age frequency of monozygotic and dizygotic twinning with those of Greulich. The structure of his curves and our own are strikingly alike, which proves two things: First, that a real and similar difference has been found in the relation of age to the two forms of twinning by independent observers using different methods on entirely separate material. Second, since these two studies are so similar and since in one case the differentiation into two types was made by the membranes and in the other by a physical

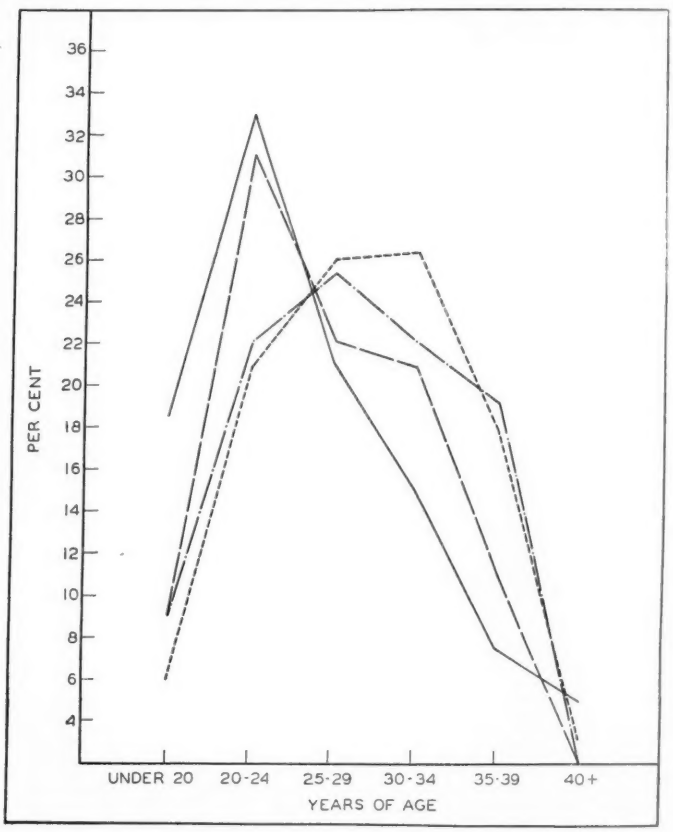

Fig. 2.—Comparison of age distribution of mothers bearing dizygotic twins in two separate series, in one the variety of twin differentiated by a study of the fetal membranes (Guttmacher) and in the other by a physical comparison of the pair years after their birth (Greulich). Note the similarity between the two monozygotic curves and between the two dizygotic curves.

———— Age distribution of mothers bearing monozygotic twins as diagnosed by membranes.
— — — Age distribution of mothers bearing monozygotic twins as diagnosed by physical resemblance.
—.—.— Age distribution of mothers bearing dizygotic twins as diagnosed by membranes.
- - - - - Age distribution of mothers bearing dizygotic twins as diagnosed by physical resemblance.

comparison of the twins years after birth, it may be assumed that either method carefully carried out is satisfactory for separating monozygotic from dizygotic twinning.

PARITY OF THE PATIENT

The influence of parity on the two forms of twinning is recorded in Table II and graphically depicted in Fig. 3. Monozygotic twinning occurs to the women of various parity with the same frequency that would be expected were it just a chance phenomenon. Dizygotic twinning, however, is relatively infrequent in primiparas and secundiparas (two-thirds as frequent as if it were the expression of chance distribution), but it is excessively frequent in the grandes multiparas (twice as common as if it were the expression of chance distribution).

It is impossible to say whether this increased dizygotic twinning in grandes multiparas is just another expression of the age factor or if the

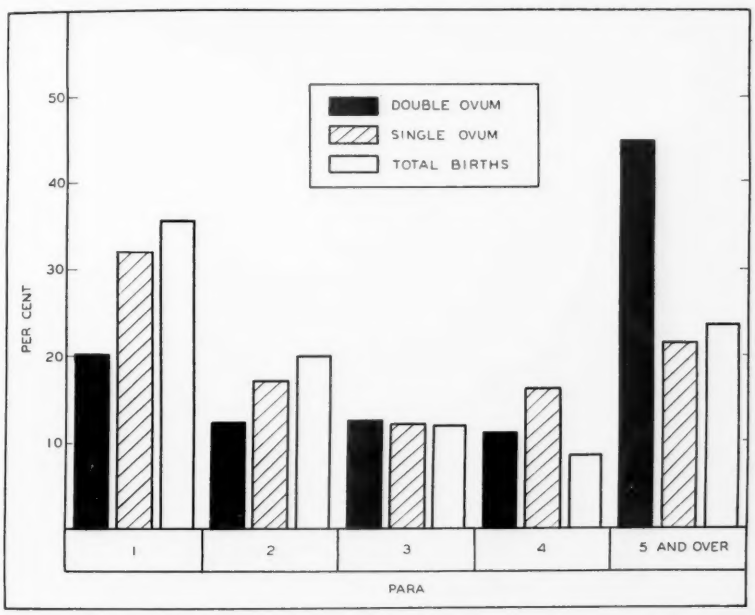

Fig. 3.—476 dizygotic and monozygotic twin-bearing mothers divided into the different parity groups and compared with the parity distribution of the total obstetric clinic population. For example, the first three columns show that 20.2 per cent of all the dizygotic twins were born to primiparas and 31.9 per cent of all the monozygotic, while primiparas formed 35.9 per cent of all mothers who gave birth to viable infants.

TABLE I. THE AGE DISTRIBUTION OF MOTHERS BEARING SINGLE OVUM AND DOUBLE OVUM TWINS COMPARED TO THE AGE DISTRIBUTION OF ALL PATIENTS ADMITTED TO THE OBSTETRICAL SERVICE OF THE JOHNS HOPKINS HOSPITAL

	UNDER 20 YEARS	20-25	25-30	30-35	35-40	40+
General obstetric clinic population, 9,589 consecutive admissions	27.1%	32.0%	19.1%	11.9%	7.5%	2.4%
Single ovum twins, 119 cases	18.5%	32.8%	21.0%	15.1%	7.6%	5.0%
Double ovum twins 354 cases	9.3%	22.3%	25.4%	22.1%	19.2%	1.7%

TABLE II. THE COMPARISON OF THE PARITY OF MOTHERS BEARING SINGLE OVUM AND DOUBLE OVUM TWINS WITH THE DISTRIBUTION OF PARITY IN THE WHOLE OBSTETRICAL CLINIC POPULATION

	PARA I	PARA II	PARA III	PARA IV	PARA V+
General obstetric clinic population, 29,227 consecutive viable deliveries	35.9%	20.0%	11.9%	8.4%	23.8%
Single ovum twins, 119 cases	31.9%	17.6%	11.8%	16.0%	22.7%
Double ovum twins, 357 cases	20.2%	11.8%	12.6%	10.6%	44.8%

age factor is just another expression of the parity, or if two separate factors are represented. This could only be determined on a series much larger than our own, when the frequency of dizygotic twinning in primiparas of the various age groups could be studied. Also, the frequency of dizygotic twinning in grandes multiparas of the different age levels would have to be investigated.

CONCLUSIONS

1. Monozygotic and dizygotic twinning represent fundamentally separate biologic processes as evidence by differences in heredity, in the likelihood for recurrence and in the influences of age and parity. Monozygotic twinning, true twinning or "twaining," appears to be a chance phenomenon while dizygotic twinning or the birth of a litter of two seems to be regulated by special laws.

2. The differentiation of twins into two types seems to be equally satisfactory if done by a study of the fetal membranes or the physical comparison of the twins themselves months or years after birth.

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Stevens: Congenital Obstructions of the Female Urethra, J. A. M. A. **106:** 89, 1936.

Diaphragms of valves responsible for symptoms of obstruction are occasionally found in the female urethra. According to Stevens, congenital strictures are also common and meatotomy is the procedure of choice in the treatment of this condition. The olive tip bougie, skenoscope and urethroscope are the most useful instruments for the detection of urethral obstructions. The early detection and correction of obstructing congenital strictures, diaphragms and other conditions are obviously of the greatest importance.

J. P. GREENHILL.

MALIGNANCY OF GRANULOSA CELL TUMORS

With a Report of One Case With Recurrence After Sixteen Years

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GRANULOSA cell tumors of the ovary have in recent years appeared frequently in the literature and there are many and varying statements as to their degree of malignancy. These statements vary from that of Dworzak[1] who says, "Clinically the tumors are relatively benign. Recurrence and metastasis are relatively rare," to Novak's figure of a clinical malignancy rate of 28.1 per cent. However, the consensus of opinion is that the malignancy rate is between 5 and 10 per cent. The following table (Table I) will give some idea on this subject, but in view of the fact that some of these figures may overlap due to recent zealous interest in these cases, these are not meant to represent the absolute.

In this series of 187 cases, the outcome of 72 patients has not been recorded. Of the 115 patients remaining, 14 or 12.1 per cent either died postoperatively or the tumor was a postmortem finding, 20, or 17.4 per cent are dead or recorded as inoperable from metastasis or recurrence, and 81 or 70.5 per cent are well from periods varying from two months to fifteen years after operation. Of the latter, Klaften reports one patient living and well eleven years after a second operation, when a tumor identical with that removed at the first operation was removed, and Rummeld reports one case living and well ten years after a secondary operation.

In view of the interest of these last two cases, I am reporting the following:

A. H., a forty-four-year-old white woman, was admitted to St. Agnes Hospital, Baltimore, on April 17, 1919, with the following history: Married, eight children, all normal deliveries, no miscarriages. The oldest child twenty-four years, youngest eight years. She began to menstruate at eleven years of age and the periods had always been regular and normal. She had enjoyed perfect health until nine months before, when she began to have some pain in the right iliac region, and about one month later she noticed a lump in this region which felt about the size of a hen's egg. This gradually enlarged and with increase in size the pain increased in intensity.

Examination showed the liver and spleen not palpable. She was not sensitive to pressure in the region of their location. A large tumor was easily palpable in the lower part of the abdominal cavity which it seemed to fill and extended upward to the umbilicus. On palpation it seemed to be hard and firm on the right side and rather soft on the left. There seemed to be two tumors, the right feeling like a fibroid, the left like an ovarian cyst. The urine was negative.

On April 22, 1919, through a midline suprapubic incision, J. K. B. E. Seegar disclosed a large, irregular, ovarian mass with a distinct sulcus pushing it in the midline. One-half of the tumor was very soft and filled with bloody fluid, the

TABLE I

AUTHOR	NO. OF CASES	POSTOPERATIVE DEATHS OR POSTMORTEM FINDING	DEATH OR HOPELESS CASES FROM METASTASIS OR RECURRENCE	WELL	OUTCOME UNACCOUNTED
Aschner[2]	2		1 died with recurrence 6 mo. after operation	1 living and well 1½ yr. after operation	
Brenner	3	2 found at postmortem exam. 1 died after operation			
Compton	1			1 living and well 1 yr. after second operation and 17 yr. after first operation	
Dailey[3]	2				2
Dworzak[1]	1			1 living and well 1¾ yr. after operation	
Eastlake[4]	1(?)			1 living and well 2 yr. after operation	
Elterich[5]	1	No operation			1
Fahmy[6]	3				3
Frankl[7]	1				1
Gottschalk	1			1 living and well 4½ yr. after operation	
Habbe[8]	32	2	1 died one yr. after operation and 17 yr. after first operation	8 living and well under 1 yr. 3 living and well under 2 yr. 4 living and well 4 yr. 1 living and well 5 yr. 1 living and well 10 yr.	12
Holmer[9]	1		1 recurrence in less than 1 yr. Outcome not reported		
Isbruch[10]	3			1 living and well 11 yr. after operation 2 lived for many yr. in perfect health	
V. Kahlden	1				1
Kelley and Gnassi[11]	1				1
King[12]	2				2
Klaften[13]	10	1 died of pneuponia after operation 1 died, carcinoma of stomach		7 living and well 1 living and well after removal of 11 yr. recurrence	
Krompecher[14]	13				13
Lepper, Baker and Vaux[15]	7			6 living and well 4 to 15 yr. after operation 1 living and well 11 mo. after operation	

TABLE I—CONT'D

AUTHOR	NO. OF CASES	POSTOPERATIVE DEATHS OR POSTMORTEM FINDING	DEATH OR HOPELESS CASES FROM METASTASIS OR RECURRENCE	WELL	OUTCOME UNACCOUNTED
R. Meyer[16]	33	1	3	19 living and well 1 to 4 yr. after operation	10
Mullerheim	2			1 living and well 8 yr. after operation	1
Murphy[17]	7	1 died 9 yr. after operation with cerebral hemorrhage 1 died 6 days after operation	1 died 13 mo. after operation 1 died 6 mo. after operation	1 living and well 3 yr. after operation 2 living and well 1½ yr. after operation	
Neumann[18]	6	1	1 died in 6 mo. with recurrence	4 living and well 2½ yr. after operation	
Novak[19, 20]	30	2	4 (inoperable) 1 recurrence in 3 yr. 1 recurrence in 1⅓ yr. 1 recurrence in 7 yr. 1 recurrence in 1½ yr. 1 recurrence in 2½ mo.	1 living and well 2 mo. after operation 1 living and well 1 yr. after operation 1 living and well 2 yr. after operation	16
Plate[21]	1				1
Robinson[22]	1				1
Rummeld	1			1 living and well 10 yr. after second operation	
Scheyer[23]	1				1
Schiffmann[24]	2 1(?)				2 1
Schroder	1				1
Schulze[25]	4		1 died 4 yr. after operation with recurrence	2 living and well 1 yr. after operation 1 living and well 11 mo. 1 living and well 15 yr.	
Soltmann[26]	1	1 died 10 days after operation	Spinal metastasis found at postmortem		
Taylor[27]	1			1 living and well 3 yr. after operation	
TeLinde[28]	4			1 living and well 4 yr. after operation 2 living and well 2 yr. after operation 1 living and well 1 yr. after operation	
Taussig[29]	1				1
Tietze[30]	1				1
Voigt	1		1 died in 6 mo. with recurrence		

TABLE I—CONT'D

AUTHOR	NO. OF CASES	POSTOPERATIVE DEATHS OR POSTMORTEM FINDING	DEATH OR HOPELESS CASES FROM METASTASIS OR RECURRENCE	WELL	OUTCOME UNACCOUNTED
Wolfe and Kaminester[31]	2			1 living and well 6 mo. after operation 1 living and well 15 yr.	
Total	187	14 (7.5%)	20 (10.6%)	81 (43.3%)	72 (38.6%)
% of 115 cases followed		12.1	17.4	70.5	

other very hard and glandular (?). This gave the physical appearance of a bilateral cyst, especially as the soft one occupied the left side of the abdomen and the hard one the right side. There were numerous adhesions to the bladder and posterior surface of the broad ligament and to the omentum and small intestine, the most serious being to the mesentery of the lower ileum. In trying to lift the tumor through the incision the right tumor ruptured and some fibrin and serous fluid escaped into the general peritoneal cavity. Later the two halves of the cyst, where it was connected by a very narrow isthmus about 3 cm. wide, parted. It was very friable and broke with very little tension. The pedicle was elongated, and it was ligated very low down on the broad ligament, and the tumor along with the left tube was removed. The right tube and ovary were normal in appearance. The uterus was very much enlarged to about the size of a two months' pregnancy and was very soft. The appendix was not examined.

Following this, a pathologic examination was made by the late Dr. J. C. Bloodgood which described the two tumors separately as measuring "16 by 12 by 7 cm." and "18 by 8 by 4 cm." and both as having "a distinct capsule" and being "generally cystic" with the cysts containing "clear, blood-stained, and bloody fluid." "The tissue beneath and beyond the capsule" was described as looking "like the cortex of the brain" and was "soft and breaks like brain tissue demonstrating little or no intracellular stroma."

The microscopic picture was described as "a carcinoma, cells occurring in large lobes with only a very fine stroma, and in smaller strands with more stroma." The cells have moderately well-stained protoplasm and round or oval reticulated light, to dark, staining nuclei. Mitoses seen. Also areas of same tumor invading fibrous tissue, some hemorrhage, and necrosis in some places almost resembling caseation.

Following this operation, convalescence was uneventful, and the patient was not seen until sixteen years later when she came to me at the Hospital for the Women of Maryland, Baltimore, on June 11, 1935, at the age of sixty, complaining of a tumor of the womb. At this time she stated that four years before she had started to bleed vaginally for the first time since the above operation. This bleeding was small in amount and lasted four days. It then stopped until two years before, since which time she had had occasional bleeding and for three weeks a small amount each day.

On June 16, 1935, she was admitted to the hospital (Unit No. 9066). Besides the above history of bleeding and her previous history, she only added that she had a slight urinary frequency and occasional nocturia. She had also noticed for a few months that her "stomach would get very large and hard at times." Examination showed a lower midline abdominal palpable mass which was not tender and seemed to be on the anterior uterine wall.

On June 19, 1935, through a suprapubic midline incision, the omentum was found to be markedly adherent to the old scar and left adnexal region, and there was some old free blood in the peritoneal cavity. The adhesions were freed, revealing a mass about 10 cm. in diameter in the right vesicouterine fold which felt cystic in areas, under smooth peritoneum, but apparently on top of and not involving the bladder. The left tube and ovary had been removed at previous operation and the uterus, which was pushed posteriorly, was soft and about the size of a one and one-half months' pregnancy. The right tube and ovary were free and normal and in no way connected with the mass in the right vesicouterine fold. This mass was first dissected free by splitting the peritoneum and freeing it from the bladder and anterior uterine wall to which it was adherent. A routine supravaginal subtotal hysterectomy and right salpingo-oophorectomy was then done, the appendix and gallbladder examined and found to be entirely normal, and the abdomen closed following which a posterior colporrhaphy was done. Her convalescence was uneventful.

Pathologic Report.—Gross: 1. A globular mass of tissue measuring 8 cm. in diameter, nodular, soft in consistency, resembling a cyst, completely encapsulated with a thin-walled capsule and a bluish mottled color. On section the capsule was

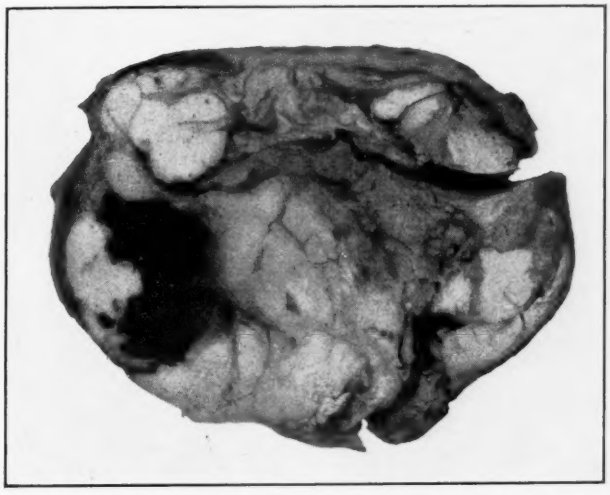

Fig. 1.—Tumor bisected showing continuity of capsule, hemorrhagic areas, and areas of necrosis.

rough in appearance, giving the impression that it was adherent to adjacent structures. On section there were several hemorrhagic cystic areas, the largest 1½ cm. in diameter. The substance cut with ease and was of a light color, aptly described as "like cooked sweetbreads." One area had a necrotic appearance (see Fig. 1).

2. *Uterus:* Supracervically removed and previously opened measuring 11 by 8 by 5½ cm. Walls were 3½ cm. thick. The cavity appeared slightly enlarged and the endometrium was thickened and had a hyperplastic appearance (Fig. 2). The right tube and ovary were attached and the tube was 7 cm. long and normal in appearance with the lumen patent and fimbria open. The ovary was normal in size and appearance.

Microscopic: 1. *The mass:* There were some areas of masses of regular, round, somewhat clear cells tending to group in cylinders and pseudoalveoli whereas in other areas these cells were arranged about blood space (see Figs. 4, 6, and 8).

2. *Uterus:* The uterine wall was normal but thick and the endometrium was surprisingly thick for a patient of this age with the glands greatly distorted in size and showing typical hyperplasia. The tube was normal and the ovary showed only marked senile atrophy (see Fig. 2).

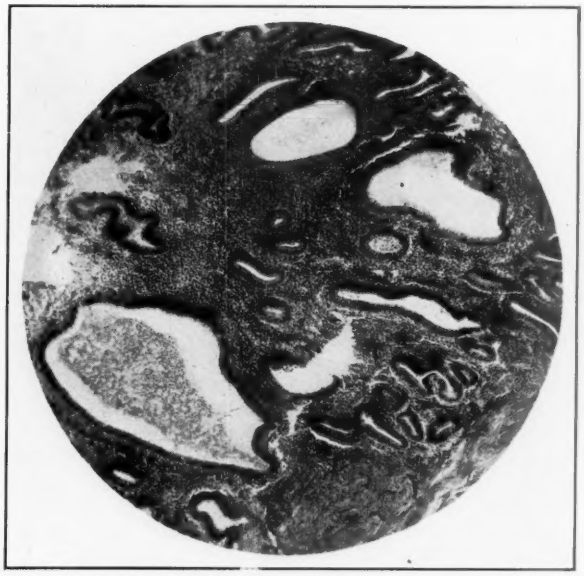

Fig. 2.—Typical Swiss-cheese pattern of endometrial hyperplasia.

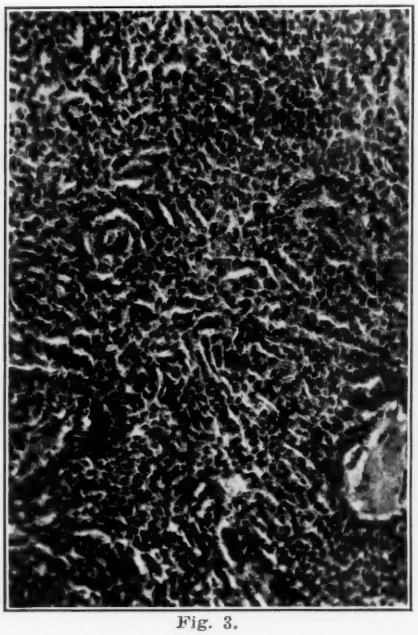

Fig. 3.

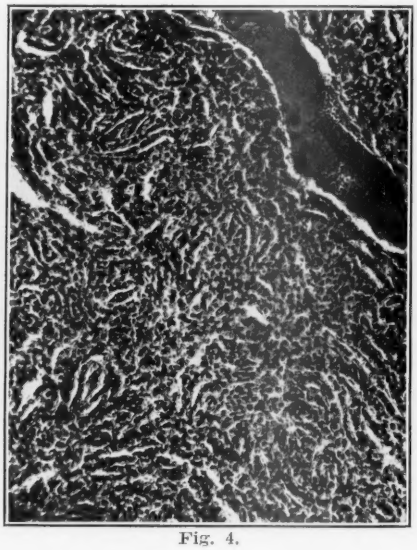

Fig. 4.

Fig. 3.—Photomicrograph of original tumor showing cylindromatous type with multiple mitotic cells.

Fig. 4.—Photomicrograph of recurrence, slightly lower power than Fig. 3, showing cylindromatous pattern.

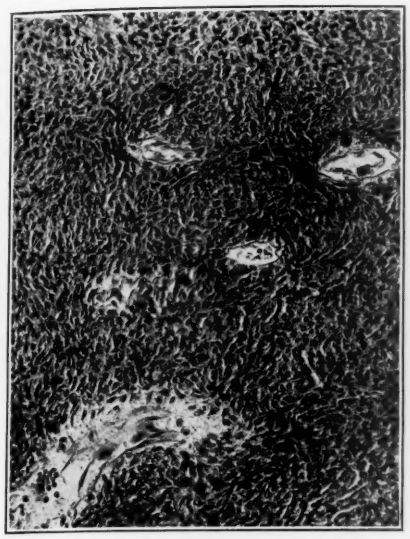

Fig. 5.

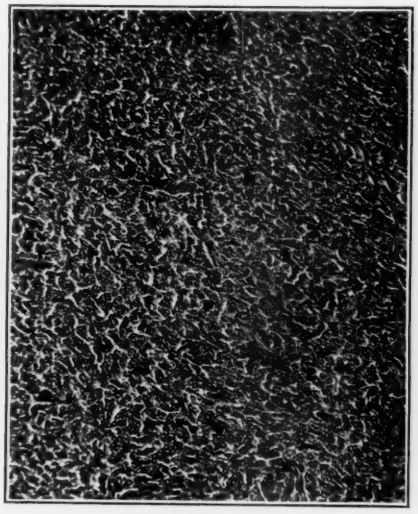

Fig. 6.

Fig. 5.—Photomicrograph of original tumor showing area of fibrosis and cells in strandlike pattern.

Fig. 6.—Photomicrograph of recurrence showing cells in strandlike pattern.

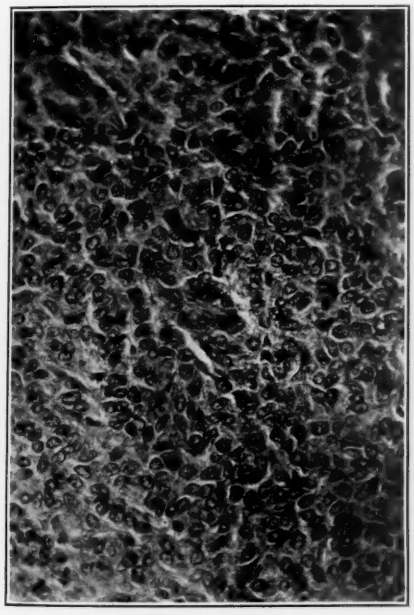

Fig. 7.

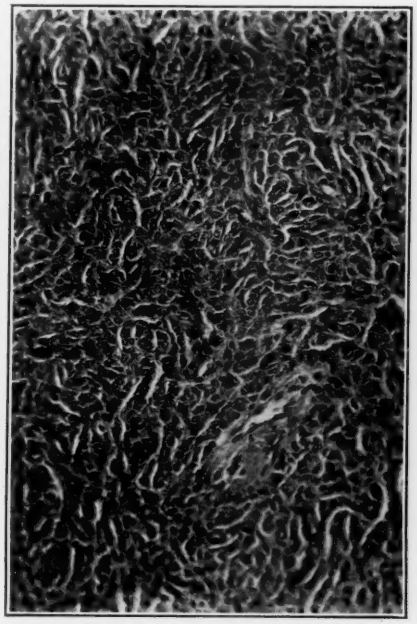

Fig. 8.

Fig. 7.—Photomicrograph (higher power) of original tumor in very cellular area.

Fig. 8.—Photomicrograph (higher power) of recurrence showing mitotic figures, cylindromatous arrangement, and some fibrosis.

The sections of the tumor were at a later date seen by J. M. Hundley, Spencer, Novak, and myself of Baltimore and by George Stewart of New York and Robert Meyer of Berlin and the diagnosis of granulosa cell tumor was made.

The sections of the tumor removed in 1919 were then procured through George A. Stewart of the Johns Hopkins Hospital and photomicrographs were made which are here shown comparing them with the tumor removed June 19, 1935. The tumor removed in 1919 is shown in Figs. 3, 5, and 7; the recurrence in Figs. 4, 6, and 8.

It is seen that these two tumors are identical in appearance, there being no microscopic differences except in the intensity of the stains, but the first tumor definitely arose from the left ovary whereas the recent tumor had no connection with the remaining right ovary but arose in the vesicouterine fold. Furthermore, the latter was beneath glistening healthy peritoneum which showed no evidence of adhesions or other abnormalities. Thus, I am led to assume that the recurrence arose either from aberrant ovarian tissue with a granulosa cell rest or from a transplant of the previously removed tumor.

In September, 1936, fourteen months after the second operation, this patient was seen and examined. The operative result was good and no evidence of recurrence could be found. X-ray therapy was advised for the second time and refused.

In this case which I have presented, the patient at forty-four years showed a large left ovarian neoplasm with an enlarged somewhat boggy uterus, but no menstrual irregularities or intermenstrual bleeding. Sixteen years later, some years after the expected menopause, she again showed an enlarged uterus with definite endometrial hyperplasia, a pelvic neoplasm microscopically identical with the first tumor, and periodic uterine bleeding. These findings all show evidence of excessive and prolonged folliculin stimulation produced by this feminizing type of tumor.

Whether the second tumor arose from a granulosa cell rest or from a recurrence of the previously removed tumor, I cannot say or prove, but the evidence leads me to lean toward the former.

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TREATMENT OF OBSTRUCTED FALLOPIAN TUBES IN STERILITY BY DIATHERMY AND TUBAL INSUFFLATION

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SURGICAL reestablishment of the lumen of the fallopian tubes has met with only limited success. It is most successful when the obstruction is at the fimbriated end of the tube. When the obstruction is at the isthmic or intramural portion, the results from surgical correction have proved less satisfactory. Any nonsurgical measure which has some promise of improving the tubal status must be considered worth while. Repeated insufflation has in a number of instances proved to be effective.

I have found that diathermy treatment combined with insufflation exerts a reparative influence on some chronically diseased tubes, leading to the restoration of patency, and is followed by pregnancy in many instances.

The beneficial effects of diathermy are produced by the action of heat. The heat is generated by a high frequency current passing through the tissues between two metal electrodes, the greatest concentration of heat being near the smaller electrode. The essential therapeutic action of heat produced by diathermy is said to be due to two factors: (1) An increase in the volume of blood flow to the area treated, due to vascular dilatation; (2) A rise in local metabolism, the degree of which depends upon the actual temperature attained. Relief of pain and of spasm usually results. The explanation of this effect, however, is not yet clear. The increased permeation with heated blood is probably the therapeutic factor of most importance. Diathermy distributes the heat deeply in the tissues, rendering the vascular dilatation widespread and therefore more effective than methods of superficial heat application.

This report is based on the treatment of 44 cases of tubal obstruction as determined by tubal insufflation before treatment was started. There were 30 cases of primary sterility and 14 cases of secondary sterility. Of the 44 patients treated, patency was reestablished to some degree in 25 cases. Of these 25 women, 9 became pregnant and gave birth to normal children. Two patients developed ectopic pregnancies necessitating operation. In 14 instances no pregnancies have been noted as yet.

Each patient received diathermy treatments one to three times a week, total ranging from 15 to 59 treatments. Each treatment lasted

from thirty to forty-five minutes, using from 2,500 to 3,000 milliamperes of current with the abdominal and sacral electrodes. When the abdominal and vaginal electrodes were used, the current employed was only 2,000 to 2,500 milliamperes. The electrodes used were a concave vaginal electrode, and for the abdomen and sacrum, ordinary Cook's malleable tin metal, five by eight inches long, twenty-two gauge, made by Westinghouse Electric Company.

TECHNIC

Abdominal-Vaginal.—1. The patient is placed upon an ordinary wooden table and draped as for a gynecologic examination. An anterior plate, five by eight inches, is placed over the abdomen just above the symphysis and the same size plate placed posteriorly. Both are connected to one pole of the diathermy apparatus.

2. A lubricated concave vaginal electrode is then inserted into the posterior vaginal fornix underneath the cervix, the concavity of the electrode facing anteriorly and connected to the other pole of the diathermy apparatus.

3. The current is then gradually increased so that the maximum amount, 2,500 milliamperes, is reached in about ten to fifteen minutes and this is maintained throughout the treatment.

Abdominal-Sacral.—In the abdominal-sacral method, the same size plates are used but the anterior plate is connected to one pole of the diathermy apparatus and the sacral plate to the other pole. The current is raised to 3,000 milliamperes.

4. Until patency is established, the patient receives two tubal insufflations a month, each immediately following the diathermy treatment. The pressure is kept at 200 mm. of mercury at first for fifteen seconds, then thirty seconds, and finally as long as sixty seconds, depending upon the degree of pain and discomfort it causes. After patency is established the patient receives one tubal insufflation a month, one week after the menstrual period, immediately following the diathermy treatment, until normal tubal contractions are obtained or approximated.

The number of diathermy treatments in the 14 patients in whom tubal patency was reestablished but who did not become pregnant is shown below:

1 patient	10-20 treatments
1 patient	20-30 treatments
8 patients	30-40 treatments
3 patients	40-50 treatments
1 patient	50-60 treatments

The average number of diathermy treatments per patient was thirty-five, and the average time to establish patency was seventeen weeks.

The number of diathermy treatments in the 9 patients who became pregnant were as follows:

1 patient	20-30 treatments
5 patients	30-40 treatments
2 patients	40-50 treatments
1 patient	50-60 treatments

The average number of diathermy treatments per patient was thirty-eight. The average time necessary to establish patency was sixteen weeks.

Two cases (1 and 2) illustrating the tubal status before, during, and at completion of treatment of two patients who did not become pregnant are given here.

CASE 1.—G. H., aged twenty-six, married four years, was never pregnant. Her menses began at the age of twelve, every twenty-eight days, of four days' duration, moderate in amount. There was no pain except slight backache the first day of each period. Patient had a tonsillectomy nine years ago followed by pneumonia. No contraceptives were ever used. Hühner test positive.

Vaginal examination showed a normal introitus. The cervix was normal. The uterus was of moderate size, anteflexed, not freely movable. Both adnexa were enlarged, thickened, but not tender. Smears for gonococci were negative. This patient gave a history of pelvic gonorrheal infection ten years ago.

This patient received five tubal insufflations and 33 diathermy treatments before patency was reestablished (see Figs. 1, 2, 3, 4, and 5).

CASE 2.—H. S., aged twenty-seven, married seven years, never pregnant. Condom contraception was practiced for the first two years. Menses began at the age of sixteen, every thirty days, of five days' duration with moderate bleeding. Cramps occurred on the first day of each period.

Vaginal examination showed a normal introitus. Cervix was normal. Small anteflexed uterus, freely movable. Both adnexa were enlarged and thickened but not tender. Patient gave a history of neisserian infection ten years ago. Smears for gonococci were negative. Hühner test was positive.

This patient received five tubal insufflations and 39 diathermy treatments before normal patency was reestablished (see Figs. 6, 7, 8, 9, and 10).

I am presenting here two cases (3 and 4) illustrating the tubal status before, during and at the completion of treatment of two patients that developed ectopic pregnancies.

CASE 3.—M. B., aged thirty, married eight years, never became pregnant. Appendectomy with drainage six years ago. Dilatation and curettage for sterility three years ago. Menses began at the age of fourteen, every twenty-eight days, of four days' duration with moderate flow. Severe backache the first two days of each period.

Vaginal examination showed a moderate sized uterus, retroverted but movable. Right adnexa was normal. The left was enlarged and thickened but not tender. Smears for gonococci were negative. Hühner test was positive.

This patient had five tubal insufflations and 43 diathermy treatments and became pregnant two months after the last tubal insufflation, developing a right ectopic pregnancy requiring operation. This patient gave birth to a normal child two years later (see Figs. 11, 12, 13, 14, and 15).

CASE 4.—M. D., aged twenty-three years, married five years. Had one child four years ago, instrumental delivery, followed by a mild postpartum sepsis. Menses began at the age of fourteen, every three or four months, lasting five days, with very little flow. Hühner test was positive.

Vaginal examination showed a retroverted uterus, not freely movable. Both adnexa were enlarged but not tender. Smears for gonococci were negative.

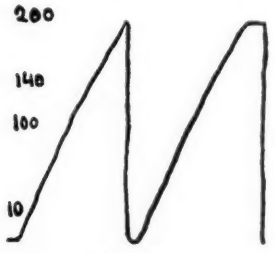

Fig. 1.

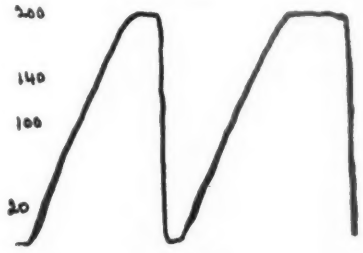

Fig. 2.

Fig. 1.—Case 1. First Rubin Test: The pressure rose to 200 mm. of mercury the first time, then was allowed to drop. The second time the pressure rose again to 200 mm. and was kept there for half a minute. The patient had central abdominal pain during the test; there were no shoulder pains when sitting up.

Fig. 2.—Case 1. Second Rubin Test: The pressure rose to 200 mm. of mercury and was maintained for half a minute the first time. The second time the pressure was kept at 200 mm. for almost one minute. The patient experienced slight central abdominal pain during the test; but no shoulder pain when sitting up.

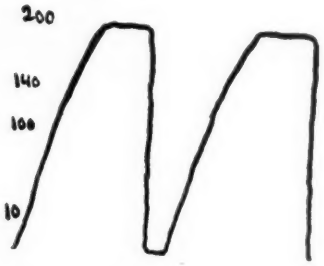

Fig. 3.

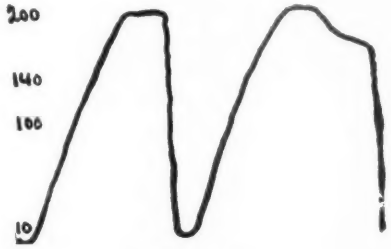

Fig. 4.

Fig. 3.—Case 1. Third Rubin Test: After ten diathermy treatments the pressure twice rose to 200 mm. of mercury; the first time the pressure was held for half a minute, and the second time for three-quarters of a minute. Very little pain was experienced during the test; shoulder pain was noted when sitting up.

Fig. 4.—Case 1. Fourth Rubin Test: After twenty-one diathermy treatments the pressure rose to 200 mm. of mercury and was kept there for half a minute, then allowed to drop. The second time the pressure rose again to 200 mm. and gradually dropped to 160 mm. No shoulder pain was complained of when sitting up.

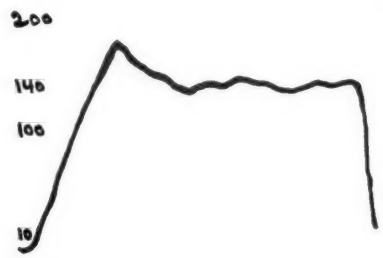

Fig. 5.—Case 1. Fifth Rubin Test: After thirty-three diathermy treatments the pressure rose to 180 mm. of mercury. The patient experienced severe pain in the right lower quadrant during the test. The pressure gradually dropped to 130 mm. and fluctuated around 130 mm. with very little tubal contractions. The patient had severe pain in the right shoulder four hours after the test.

This patient had 3 tubal insufflations and 24 diathermy treatments and developed a left ectopic pregnancy four months after the last tubal insufflation (see Figs. 16, 17, and 18).

Two cases (5 and 6) illustrating the tubal status before, during, and at the completion of treatment of two patients that developed normal pregnancies are given here.

Fig. 6.

Fig. 7.

Fig. 6.—Case 2. First Rubin Test: The pressure rose twice to 200 mm. of mercury; the second time the pressure was kept at 200 mm. for half a minute. Slight central abdominal pain occurred during the test, also pain in the left lower quadrant. No shoulder pain was complained of when the patient sat up.

Fig. 7.—Case 2. Second Rubin Test: After twelve diathermy treatments, the pressure rose to 200 mm. of mercury and was maintained at that level twice for half a minute. The patient complained of pain in the left lower quadrant during the test; but no shoulder pains when sitting up.

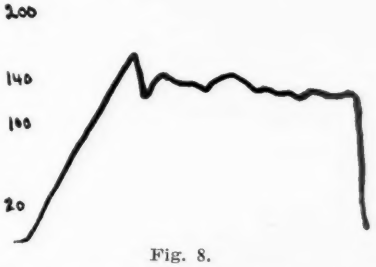

Fig. 8.

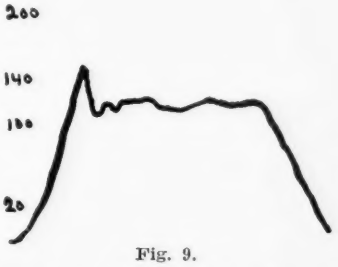

Fig. 9.

Fig. 8.—Case 2. Third Rubin Test: After twenty-one diathermy treatments, the pressure rose to 160 mm. of mercury and then dropped to 120 mm. and then rose again to 140 mm. and fluctuated around 140 mm. The patient complained of pain in the left lower quadrant during the test and of severe right shoulder pain when sitting up.

Fig. 9.—Case 2. Fourth Rubin Test: After twenty-four diathermy treatments, the pressure rose to above 170 mm. of mercury and gradually dropped to 140 mm. with very weak tubal contractions. The patient complained of pain in both lower quadrants during the test but no shoulder pains when sitting up.

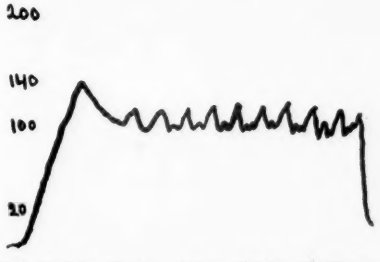

Fig. 10.—Case 2. Fifth Rubin Test: After thirty diathermy treatments, the pressure rose to 140 mm. of mercury, gradually dropped to 120 mm. and then fluctuated around 100 mm. with fairly normal tubal contractions. The patient complained of pain in the left lower quadrant during the test and severe right shoulder pain upon sitting up.

CASE 5.—S. D., aged thirty-six, married eight years, had an abortion five years ago at two months, followed by dilatation and curettage. This patient had been

sterile ever since. The menses began at the age of fifteen, every three weeks, lasting two days with a moderate amount of flow. Slight backache the first day of each period.

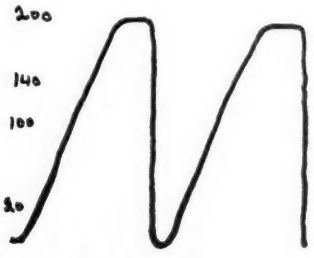

Fig. 11.

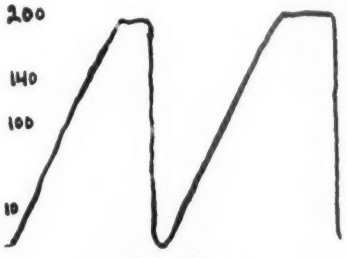

Fig. 12.

Fig. 11.—Case 3. First Rubin Test: The pressure rose twice to 200 mm. of mercury and each time was maintained for half a minute. The patient had pain in both lower quadrants during the test; but no shoulder pains when sitting up.

Fig. 12.—Case 3. Second Rubin Test: After eight diathermy treatments the pressure rose twice to 200 mm. of mercury; the first time the pressure was kept at 200 mm. for half a minute; the second time for a full minute. The patient had pain in both lower quadrants during the test; but no shoulder pains when sitting up.

Fig. 13.

Fig. 14.

Fig. 13.—Case 3. Third Rubin Test: After twenty-four diathermy treatments the pressure rose to 200 mm. of mercury and was maintained the first time for one minute and the second time for three-quarters of a minute. The patient had pain in the right lower quadrant during the test; but no shoulder pain when sitting up.

Fig. 14.—Case 3. Fourth Rubin Test: After thirty-six diathermy treatments the pressure rose to 180 mm. of mercury and gradually dropped to 160 mm. and then to 140 mm. with very slight tubal contractions. The patient had pain in the right lower quadrant during the test and pain in the right shoulder one hour after the test.

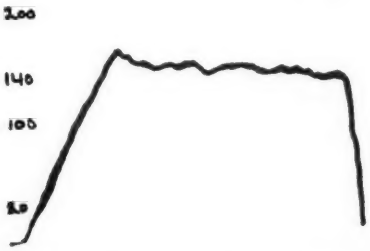

Fig. 15.—Case 3. Fifth Rubin Test: After forty-three diathermy treatments the pressure rose to 170 mm. of mercury and gradually dropped to 140 mm.; with very faint tubal contractions. The patient had slight pain in the right lower quadrant during the test; and pain in the right shoulder two hours after the test.

Vaginal examination showed a slightly enlarged uterus in anterior position, freely movable. Both adnexa were thickened but not tender. Smears for gonococci were negative.

This patient had four tubal insufflations and 36 diathermy treatments and became pregnant three months after the last tubal insufflation, and gave birth to a normal child (see Figs. 19, 20, 21, and 22).

CASE 6.—L. V., aged twenty-three, married four years, had one abortion six years ago at two months followed by dilatation and curettage. Her menses began at the age of fifteen, every twenty-eight days, of seven days' duration with profuse flow. No pain. Smears for gonococci were negative. Hühner test was positive. Vaginal examination showed a small anteflexed uterus, movable, with thickened adnexa on both sides.

Fig. 16.

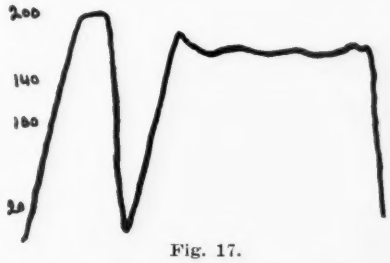

Fig. 17.

Fig. 16.—Case 4. First Rubin Test: The pressure rose to 200 mm. of mercury and was allowed to drop. The second time the pressure was kept at 200 mm. of mercury for half a minute. The patient had pain in the center of the abdomen during the test and in the left lower quadrant but no shoulder pains when sitting up.

Fig. 17.—Case 4. Second Rubin Test: After twelve diathermy treatments the pressure rose to 200 mm. of mercury and was maintained for half a minute and then allowed to drop. The second time the pressure rose only to 180 mm. of mercury and gradually dropped to 160 mm., fluctuating weakly around 160 mm. The patient complained of pain in the left lower quadrant during the test and pain in the right shoulder when sitting up.

Fig. 18.—Case 4. Third Rubin Test: After twenty-four diathermy treatments the pressure rose to almost 170 mm. of mercury, dropped to 120 mm. and rose again to 140 mm. and fluctuated around 130 mm. with very weak tubal contractions. The patient complained of left lower quadrant pain during the test and severe pain in the right shoulder ten minutes after the test.

This patient had five tubal insufflations and 23 diathermy treatments. She became pregnant four months after the last tubal insufflation and gave birth to a normal child (see Figs. 23, 24, 25, 26, and 27).

COMMENT

At the beginning of these treatments, the temperature of the vaginal electrodes was taken and found to reach from 106° to 108° F. After

the first six cases, vaginal temperatures were no longer taken because in practically all six cases when the current was raised to 2,500 milliamperes the temperature in the vaginal electrodes remained between 106° and 108° F.

In two of the patients in this series I used the abdominal-sacral electrodes because they both followed postpartum infection.

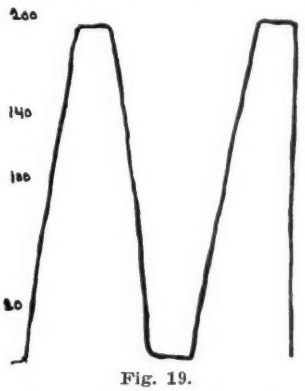

Fig. 19.

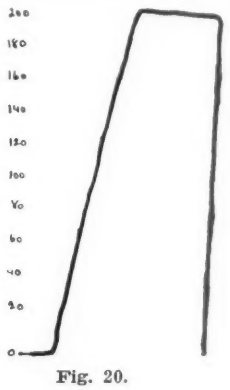

Fig. 20.

Fig. 19.—Case 5. First Rubin Test: The pressure rose twice to 200 mm. of mercury; there was practically no pain during the test.

Fig. 20.—Case 5. Second Rubin Test: After eight diathermy treatments the pressure rose to 200 mm. of mercury and was maintained for three-quarters of a minute, then allowed to drop. There was no pain during the test.

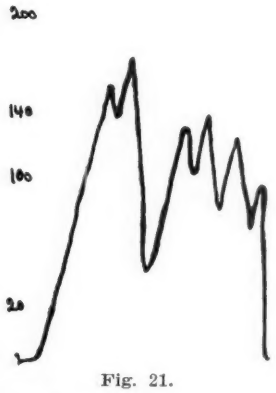

Fig. 21.

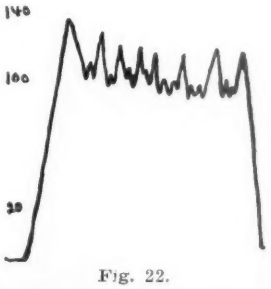

Fig. 22.

Fig. 21.—Case 5. Third Rubin Test: After twenty-four diathermy treatments the pressure rose to 160 mm. and dropped to 140 mm. and then rose again to 180 mm. and dropped to about 50 mm., rising again to about 130 mm., fluctuating between 70 and 130 mm. There was no pain during the test and no shoulder pains when sitting up.

Fig. 22.—Case 5. Fourth Rubin Test: After thirty-six diathermy treatments the pressure rose to 140 mm. of mercury, dropped to 100 mm. and then fluctuated between 90 mm. and 120 mm. with very good normal tubal contractions. The patient had no pain during or after the test. Appropriate tests showed that this patient was hyposensitive to pain.

The combined treatment of diathermy and tubal insufflation may produce a favorable result in patients in whom the tubes are the seat of extensive strictures, agglutinations, and adhesions which can be overcome by a pressure of approximately 200 mm. of mercury.

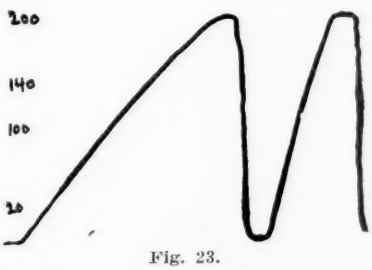

Fig. 23.

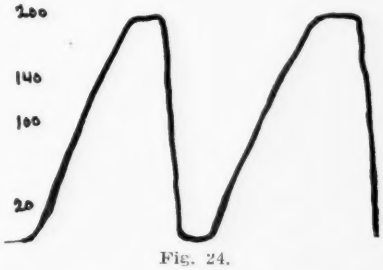

Fig. 24.

Fig. 23.—Case 6. First Rubin Test: The pressure rose twice to 200 mm. of mercury, and was maintained for half a minute. The patient had severe central abdominal pain at first, which gradually radiated to the right lower quadrant during the test, but no shoulder pains when sitting up.

Fig. 24.—Case 6. Second Rubin Test: After one month, the pressure rose to 200 mm. of mercury and was maintained the first time for three-quarters of a minute and the second time for one full minute. The patient complained of severe pain in the right lower quadrant during the test; but no shoulder pains when sitting up.

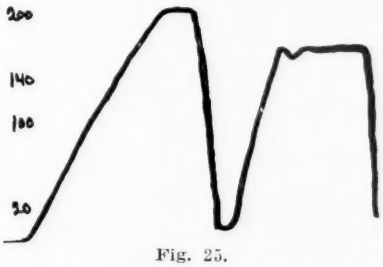

Fig. 25.

Fig. 26.

Fig. 25.—Case 6. Third Rubin Test: After ten diathermy treatments, the pressure rose to 200 mm. and was maintained for three-quarters of a minute and then allowed to drop. The second time the pressure rose only to 160 mm. and dropped to 150 mm. and fluctuated slightly around that point. The patient experienced slight right shoulder pain two hours after the test.

Fig. 26.—Case 6. Fourth Rubin Test: After eighteen diathermy treatments the pressure rose to a little above 140 mm. of mercury and then dropped to 130 mm. and fluctuated around 130 mm. with very faint tubal contractions. The patient complained of pain in the right lower quadrant during the test and pain in the right shoulder after the test.

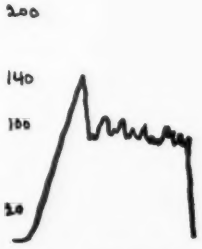

Fig. 27.—Case 6. Fifth Rubin Test: After twenty-two diathermy treatments the pressure rose to 142 mm. of mercury and then dropped to a little above 80 mm. and fluctuated between 80 and 100 mm. with fairly normal tubal contractions. This patient had severe shoulder pain three hours after the Rubin test. Four months after the last tubal insufflation the patient became pregnant and later gave birth to an eight-pound baby.

Success is less likely when the tubes are organically altered as in hydrosalpinx. There, a pressure of 200 mm. of mercury only rarely produces an artificial opening. Although a pressure greater than 200 mm. of mercury has opened strictured tubes, without the use of diathermy, I have not exceeded the maximum of 200 mm. of mercury advised by Dr. Rubin. I do not know how many of these cases may have been of this group, as I have not resorted to lipiodol injections of the tubes which Rubin has demonstrated produces inspissations and foreign body reactions which would render the already impaired tubal lumen hopelessly impermeable.

The observation of two cases of ectopic pregnancy in this group is of special interest. Though patency was reestablished in these two cases, the kymographic curve obtained in each during insufflation indicated very weak and shallow contractions at a relatively high pressure level. The curves obtained in the cases of normal pregnancy were rhythmic oscillations at a lower level, as in physiologic tubal patency. Rubin has called attention to the fact that ectopic pregnancy is more likely to develop in tubes the seat of adhesions and strictures where the pressure levels exceed 150 mm. of mercury as against normal intrauterine pregnancy where the pressure levels are about 100 mm. of mercury or less.

Tubal patency has been reestablished in a large number of cases by repeated tubal insufflation alone and to a lesser extent by diathermy treatments alone. It is very difficult to estimate just how much therapeutic value is to be accorded to the diathermy and how much to the tubal insufflation. In my opinion a greater number of successful cases will be obtained by the combined method of tubal insufflation and the diathermy, using the vaginoabdominal method.

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The split pelvis occurs in the predentate dinosaurs, birds and sporadically in certain orders of the mammalia. It has arisen in response to the demands of parturition also in the human female.

The underlying evolutionary principle is the law of the split pelvis, which states: When disproportion occurs between the products of conception and the pelvic brim, separation of the ventral symphysis occurs in those types which survive. In evaluating parturition allowance must be made for these evolutionary factors, which at present are independent of human control.

J. P. Greenhill.

A STUDY OF ONE HUNDRED CONSECUTIVE CASES OF ECTOPIC PREGNANCY

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IN DECEMBER of 1930 the author reported in this JOURNAL a study of fifty consecutive ectopic pregnancies cared for at the Evanston Hospital in the Department of Gynecology and Obstetrics. They occurred during the period from Jan. 1, 1922, through the first half of 1928 (to July 1, 1928). There have been fifty more since then to Jan. 1, 1936, fourteen years in all. This was an average incidence of seven cases per year. In the latter number there have been two deaths, whereas in the former there was only one. This makes a mortality of 3 per cent for the one hundred cases.

As in the first report, an attempt has been made to correlate ideas which would be helpful in diagnosis. In the study of these histories, we found that in many cases the onset was insidious, there being nothing at first which alarmed the woman or attracted the serious attention of the physician. Amenorrhea is the first symptom that should arouse the patient's suspicion. This was present in 76 per cent. Thus 24 per cent apparently did not "miss a period." The accuracy of this latter statement is open to question. Irregular bleeding was a most common symptom, being reported in 88 per cent. The initial bleeding was often considered by the patient as her last regular menstrual period. But on careful questioning, a period of amenorrhea, that is a cycle of more than twenty-eight days, was discovered. Too often these women did not consider this bleeding of much consequence, and allowed it to continue until other symptoms developed. Usually associated with the amenorrhea and bleeding there were subjective symptoms of early pregnancy, such as breast changes, nausea, and drowsiness. The pelvic discomfort was greater than that usually present in a normal intrauterine pregnancy. There were cramplike pains on one side or the other which varied in severity. In this series three women who had had previous ectopic pregnancies reported to their physicians with no more than the above-mentioned symptoms. In all three cases a tubal pregnancy was found. Most women considered themselves pregnant and threatening to abort or to have aborted. Many women stated that they had passed a pink piece of tissue which they considered products of conception. Seven times this was saved and brought to the hospital for microscopic examination; the pathologist reported a "decidual cast of endometrium"

with no chorionic villi. In gross appearance it was thinner and paler than placental tissue. The expulsion of decidual tissue spoke strongly for the presence of ectopic pregnancy. The irregular bleeding varied greatly in amount but usually was scant. It appeared only for a few hours and recurred at intervals varying from hours to days. Occasionally it was as much as a heavy menstrual flow but was rarely as severe as is seen in uterine abortion. This blood came from the uterine endometrium and not from the tubes. It probably commenced with the detachment or death of the embryo.

Pain was a constant symptom in this series, being present in every case; the severity varying with the extent of the gestation and whether or not there had been a rupture with intraabdominal hemorrhage. Before rupture there may have been all the physical signs of early pregnancy, including Jacquemier's sign, Cullen's sign, Hegar's sign, and enlargement of the uterus, which was usually not over the size of a two months' pregnancy. The gestation sac may have been so small that it was easily overlooked. In early examination for pregnancy one is not justified in too vigorously manipulating the adnexa to differentiate swellings, as the corpus luteum of pregnancy may be thus ruptured, or a loosely attached intrauterine pregnancy may be separated and an abortion started. Furthermore most women are too sensitive at this time.

Sudden pain in the lower abdomen was a very common symptom, being present in 84 per cent. This was localized on one side or the other in 48 per cent: on the right side in 20 per cent, and on the left side in 28 per cent. It was usually the first thing that led these women to consult a physician. This, as a rule, meant that there had been a tubal rupture. To us, rupture means that the gestational sac has broken through the wall of the tube in which it has been growing. It may break through the serosa into the abdominal cavity, associated with hemorrhage, or into the lumen of the tube. In the latter, less hemorrhage may result due to compression of the bleeding vessels with distention of the tube. The escape of the sac may eventually be through the fimbriated end. This is called a "tubal abortion." As the tubal peristaltic action forces the sac out of the tube, intermittent severe cramplike pains may be described. Fresh blood is a peritoneal irritant. Its escape into the abdominal cavity alone may cause severe pain. This may also produce the symptoms of syncope—faintness, pallor. With a considerable amount of blood escaping into the peritoneal cavity, besides the severe pain in the lower abdomen, there may be a shoulder pain, which is the result of irritation of blood between the liver and the diaphragm. The latter symptom was reported in 14 per cent. The pulse becomes rapid and thready and the skin clammy and perspira-

tion marked. Consciousness may be lost. Even without marked blood loss tenderness of the lower abdomen and rigidity are frequent. Tenderness was present in 93 per cent of these women and was localized on the left side in 27 per cent and on the right side in 38 per cent, being on both sides in 28 per cent. Nausea and vomiting were also common, being present in 44 per cent of this series.

It is rare that patients succumb from the first attack of sudden pain. There may be several attacks before the physician is called.

Pelvic findings may be very misleading, even if one is able to make a satisfactory examination. Usually when a woman is in much pain this is not possible. A mass was found in only 56 per cent of these hundred women. It could be defined as on the left side in 20 and the right in 20 and in the posterior culdesac in 16. When the pregnancy was early, as was usually the case, the swelling was so small as to be confused in size and location with an ovary. A fresh blood clot may be pressed into by the examining fingers and go unrecognized, especially under anesthesia. When the blood clot becomes organized it is more readily palpable.

The most important laboratory finding was the leucocyte count. In this series 77.5 per cent of the cases showed a count higher than 10,000. It is an accepted fact that leucocytosis appears with intraabdominal hemorrhage. If repeated counts are taken on an individual, it will be found that great variation develops from day to day or from hour to hour. It would seem that after the blood becomes organized there is less "insult" to the peritoneum and the count will drop to normal. With new bleeding it will rise again.

The diagnosis of ectopic pregnancy, we feel, then is most difficult before rupture. Since the last series was written, the Aschheim-Zondek test has come into use and has been of aid in making a definite early diagnosis of pregnancy. With rupture and its typical symptoms, diagnosis should be comparatively easy. However, when not seen until some time after rupture, the acute symptoms may have subsided; a slight fever may develop and the leucocyte count may be nearly normal; the severe pain becomes a dull ache; syncope and pallor have disappeared. The picture now resembles pelvic inflammation. The palpable mass can be confused with an inflammatory process. Here again the Aschheim-Zondek test is of help and a chronologic history of events should be carefully studied. The pregnancy may have aborted through the tube and the bleeding ceased spontaneously. One of several things may follow: profuse hemorrhage, shock, and death; operation with recovery or the products of conception be completely absorbed, or the ovum find a new site for attachment and continue to grow as an abdominal pregnancy.

In Table I is shown the time elapsed from the onset of symptoms to the day of operation. Two-thirds of these women went two weeks and the other third from three to ten weeks. The earlier a diagnosis can be made the better the prognosis for the patient. But on the other

TABLE I. TIME FROM ONSET OF SYMPTOMS TO DAY OF OPERATION IN 90 RECORDED CASES

Same day	16.6%	
First week	31.1%	66.5%
Second week	18.8%	
Third week	12.2%	
Fourth week	5.5%	
Fifth week	3.3%	
Sixth week	5.5%	
Seventh week	3.3%	
Eighth week	2.2%	
Tenth week	1.1%	
	99.6%	

hand these figures show that the patient's condition may not be critical for quite some time. Usually sufficient time may be taken for adequate examination. However, if an ectopic pregnancy is suspected, the patient is much safer in a hospital where repeated blood counts can be taken and constant observation is possible. A blood grouping should be taken for transfusion in case of an emergency. Laparotomy and excision of the pregnant tube should be done as soon as a diagnosis is made. It is better to operate too often for ectopic pregnancy than not often enough. Posterior colpotomy was carried out in a few of the first fifty cases and in none of the latter. A curettage prior to laparotomy was done only fourteen times. Usually this was because a diagnosis of incomplete abortion had been made. As a diagnostic procedure it should be done infrequently. Our experience has shown that following curettage or colpotomy the morbidity is greatly increased. The time spent in the hospital usually was not long before diagnosis was established. In this series, 48 per cent were operated upon on the day of admission and only 16 per cent after the third day. Other pathologic conditions were often encountered. The incidence of salpingitis was lower than reported in most other studies, being only 17 per cent. Ovarian and parovarian cysts were noted in 18 per cent, chronic appendicitis in 4 per cent, and uterine fibroma in 4 per cent.

As a rule one should not attempt to do anything more than a removal of the affected tube. Our usual procedure was the same as formerly reported. The abdomen was quickly opened. The presence of free blood at once confirmed the diagnosis. The offending tube was located as quickly as possible. If so much blood was present that the pelvic structures were obscured, the pregnant tube was rapidly located by the palpating fingers. It was brought into view and a clamp placed on the uterine end and another just outside the fimbriated end. If the condi-

tion of the woman permitted and if the ovary was healthy, the tube was excised, leaving the ovary in situ. Bleeding points on the anterior edge of the broad ligament were caught separately and ligated, after which the upper edge of the broad ligament was sewed over with a fine catgut suture. A wedge of tissue from the uterine horn was included with the proximal end of the tube to obviate the danger of a later ectopic pregnancy in the tubal stump. If the condition of the patient was bad the tube and ovary were removed, controlling hemorrhage by a figure-of-eight suture ligature, taking in the entire upper portion of the broad ligament.

The opposite tube was not disturbed unless it showed sufficient changes to justify it. Other than removing large firm clots which were easily accessible, the removal of blood added to the length of the operation and operative trauma. In none of our cases have we had reason to regret this course, and it is possible that reabsorption of the blood may have been of some value. We found it rarely necessary to use laparotomy pads. Intraabdominal manipulation was minimized to the greatest possible degree. Infusion of gum-acacia in combating shock was a useful procedure prior to or during operation. Transfusion was used in women who were greatly exsanguinated, but not until hemorrhage had been controlled.

Postoperative care was simple. For the first twenty-four hours morphine sulphate was used rather freely and fluids were given as often as indicated.

Other procedures were done in this series as shown in Table II. We do not recommend them. Oophorectomy was done 37 times. Most of these were done as a matter of expediency as mentioned above or because

TABLE II. OPERATIVE PROCEDURES

In addition to removing the pregnant tube the following was done:		
Oophorectomy		37
Single	34	
Both	3	
Curettage		14
Appendectomy		11
Other tube excised		8
Hysterectomy		7
Myomectomy		1
Baldy-Webster operation		1
Defundation		1
Culdesac drainage through rectum		1

the tube could not be excised without destroying the blood supply to the ovary. Appendectomy was done 11 times, but only in women who had very little loss of blood and were in very good condition. Hysterectomy was done 7 times in women who had multiple fibroids or were over forty or for other indicated reasons.

The preoperative diagnosis was wrong in 14 per cent. Table III gives the incidence of correct or incorrect preoperative diagnosis and

TABLE III

PREOPERATIVE DIAGNOSIS			INCORRECT DIAGNOSIS	
Correct	78%		Abdominal hemorrhage	2
Suspected	3%		Ovarian cyst	4
Correct after diagnostic curettage	4%	86%	Pelvic inflammatory disease	2
			Pelvic tumor	2
Correct after draining culde-sac through rectum	1%		Retrodisplacement and appendix	1
			Acute appendicitis	1
Incorrect	14%		Myopathic bleeding	1
			Ileus	1

the wrong diagnoses are indicated. It would be interesting if we had been able to tell the number of times a diagnosis of ectopic pregnancy was made erroneously.

Of the three deaths, one was due to hemorrhage and shock, the woman being in the hospital but six hours, and five hours after operation. It occurred in 1922, the first year of this series. When she entered the hospital she was almost moribund. Had gum-acacia been available and more of our modern methods for combating shock attempted immediately she might have been saved. The second woman died on the third day after operation from lobar pneumonia. She had a profuse intraabdominal hemorrhage and was given 800 c.c. of blood by transfusion before leaving the operating table. Recovery from hemorrhage and shock was very satisfactory. The third death was the result of delay in diagnosis, and the refusal of permission for operation when made. The patient left the hospital for five days against advice, signing her own release, only to return in a much more serious condition, and was operated upon two days after the second admission.

In conclusion, we wish to stress the importance of a careful chronologic history of the symptoms and physical and laboratory findings. One should keep in mind the pathology as it appears in the three different phases, namely, before rupture, at the time of rupture, and some time after rupture. Each has its own peculiar picture.

636 CHURCH STREET

THE DIAGNOSIS OF EXTRAUTERINE PREGNANCY

An Analysis of 104 Cases

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THE literature on ectopic gestation impresses one by the frequency with which this disease is incorrectly diagnosed. Although spontaneous recovery sometimes takes place as exemplified by lithopedions, there is little doubt that delay in diagnosis results in increased mortality and morbidity from this condition. Five of the seven fatal cases in this series were incorrectly diagnosed, and in these five patients the cause of death was undoubtedly the delay in treatment that accompanied the delay in diagnosis, as shown by Table I. The economic loss in the group where an error in diagnosis was made, amounted to an average increase of ten hospital days, or twenty-eight instead of eighteen days per patient. Each of the 104 cases here studied was proved to be an extrauterine pregnancy by laparotomy or autopsy.

Frequently, the disease developed in such a typical manner, that the diagnosis was made by history alone, but in many instances it was reached only after most careful study. Many patients were admitted in shock, or operated upon so soon after admission that complete studies were not carried out. Unfortunately, the operator had often failed to differentiate tubal rupture from tubal abortion, and tubal from extrauterine pregnancy; these differentiations, however important, are omitted. The grossly ruptured cases numbered 88, or 83.3 per cent of the total, and only one of the 16 unruptured cases was correctly diagnosed, a not unusual occurrence. In some patients, rupture had apparently occurred so long before admission that infection had already taken place, thus giving a confusing clinical picture. In other instances, complicating pathology, such as uterine fibroids, ovarian cysts, or pelvic inflammatory disease, helped obscure the underlying pathology.

Table I. Illustrating Reduction of Mortality With Prompt Treatment

Preoperative Diagnosis	Time Interval From Admission to Operation		Died	Per Cent of Total 104 Cases
	Less than 72 hr.	More than 72 hr.		
Correct	92%	8%	0	35
Suspected	55%	45%	2	35
Incorrect	19%	81%	5	30

Seven of these 104 patients had been previously examined at this or other institutions and discharged without operation, or after a dilata-

tion and curettage. How far afield one may go in the diagnosis of extrauterine pregnancy is seen in the following list of diagnoses which were either incorrect or did include the extrauterine pregnancy.

TABLE II. DIAGNOSIS

	NUMBER OF CASES		NUMBER OF CASES
Pelvic inflammatory disease, pelvic abscess, or salpingitis	44	Tuberculous peritonitis	1
Abortion	14	Endometrioma	1
Uterine fibroid	13	Placenta previa	1
Twisted ovarian cyst	8	Ruptured varicosities of broad ligament	1
Ovarian cyst	5	Primary anemia	1
Acute appendicitis	4	Carcinoma of fundus	1
Intestinal obstruction	3	Chorionepithelioma	1
Parametritis	2	Carcinoma of ovary	1
Ruptured appendix	1		

The only purpose that can be served in a field already so well covered by the literature, is to remind us for what factors we may look to aid in a more prompt diagnosis.

ETIOLOGY

In the light of our present knowledge, this factor aids but little in the diagnosis of the individual case. Behney[1] suggests that a developmental defect may be inherent in the individual, such as is found in lower animals having extrauterine pregnancy. The occurrence of extrauterine pregnancy decreases with parity; however, Scheffey, Morgan and Stimson[2] found the reverse true.

Thirty-six per cent of all our patients had never been pregnant previous to the present illness. The other 64 per cent had had one or more previous full-term pregnancies or abortions. It is questionable whether a period of relative sterility is more frequently found in this disease than in other conditions, such as pelvic tumors or gonorrhea. Previous neisserian disease was suspected or proved in 20 per cent of these patients, and complicating pelvic pathology was found at operation in 18 per cent. A previous operation, abdominal or pelvic, had been performed on 15 per cent of all patients.

The youngest patient was sixteen, the oldest forty-three years of age, and 50 per cent of all patients were between twenty and thirty years of age. The presence of etiologic factors not mentioned here is acknowledged. During the five-year period from January, 1929, to December, 1933, there were 54 extrauterine pregnancies as compared with 7,452 abortions, miscarriages, and pregnancies at term, or one extrauterine pregnancy to 138 intrauterine pregnancies. Wynne[3] reports one to 303.

SYMPTOMS

Initial Symptoms.—Those first noted by the patient were invariably some combination of missed catamenia, abdominal pain, vaginal bleeding, and sudden weakness with syncope. Table III shows the relative frequency of their occurrence. The initial symptom followed the last noted menstrual period by an interval of from one day to thirteen weeks, the average being 5.2 weeks. A further study of this phenomenon was productive of no conclusion other than that the first, fourth, and eighth weeks showed the greatest frequency for onset.

TABLE III. RELATIVE FREQUENCY OF INITIAL SYMPTOMS

	NUMBER OF CASES	PERCENTAGE
Missed period (1 or more)	82	79.0
Abdominal pain	59	57.0
Vaginal bleeding	52	50.0
Syncope	11	10.5

It is understood that a past history of menstrual irregularity devaluates a missed period as a symptom; however, 79 per cent of all our patients had missed one or more periods, and of these, 85 per cent had had a past regular menstrual phase. The frequency of amenorrhea is more clearly shown in Table IV.

TABLE IV

PERIODS MISSED	NO. OF CASES	PER CENT	
0	22	21.0	
1	38	34.6	79%
2	34	32.9	
3	10	9.6	
4	2	1.9	

Sixteen of the 22 patients with no missed period had mistaken an irregular or unusual flow for their last normal period.

It is interesting to note the time interval between the onset of symptoms and the patient's admission to the hospital (Table V).

TABLE V

	NO. OF CASES	PER CENT
Admitted within 48 hours of onset	15	14.4
Admitted within 2 weeks of onset	35	33.6
Admitted after 2 weeks of onset	54	51.9

From this it is seen that only 15 patients were admitted within forty-eight hours after the onset of their symptoms, and as expected, 13 of these 15 patients experienced abdominal pain as the initial symptom; 7 of these 13 patients fainted, concurrently with the pain.

Later symptoms than those designated as initial were numerous, and often clouded the clinical picture.

Abdominal pains recurred in 82 per cent of all patients and were the most common symptom, as well as the most variable in severity, location, and type. Pain radiating to the shoulder tops has been noted by Rubin and others. In this series, 11 patients noted severe pain radiating to the right or both shoulders; other areas of radiation were to the lumbar region, rectum, vagina, groin, knee, and epigastrium. Forty-five per cent of the patients described the pain as unilateral; 85 per cent

described it as very severe; many attacks followed physical exertion. Sudden weakness and syncope concurrent with the pains occurred in 33 per cent of all cases, but not with all recurrent pains.

Vaginal bleeding was present in 80 per cent of all patients, and varied from a pink tinge to spotting or flooding. Its frequency alone as an initial symptom cannot be too greatly emphasized. Three patients described a chocolate colored discharge.

Urinary symptoms were present in 18 per cent of patients, and consisted of lower abdominal pain and burning before micturition.

Gastrointestinal symptoms consisted mainly of pain in the rectum and abdominal pain on defecation; also marked constipation. Nausea and vomiting was, for the most part, induced by the abdominal pains and occurred in 42 per cent of cases. A few presented the morning nausea and vomiting of pregnancy.

Physical findings of most interest are the abdominal and pelvic; these, however, by their diversity challenge satisfactory discussion. For comparative purposes the various physical findings are best shown in Table VI. It is of interest to note

TABLE VI. COMPARATIVE FREQUENCY OF ABDOMINAL AND PELVIC FINDINGS

	NUMBER OF CASES	PERCENTAGE
Abdominal tenderness (unilateral or bilateral)	93	90
Pelvic mass	80	77
Softened cervix	43	41
Enlarged uterus	23	22
Evident free fluid in abdomen	21	20

that 86 per cent of the pelvic masses palpated were extremely tender, which fact probably aided in the frequent incorrect diagnosis of pelvic inflammatory disease.

Temperature records of the entire 104 cases showed 31 patients, or 29.4 per cent, with an elevation of over 100° F. on admission, or before operation. Seldom did the temperature exceed 102°, and then for only a few hours.

Blood pressure determinations roughly followed the severity of the hemorrhage and were not unusual in this respect.

Blood counts: Table VII shows the relative frequency of preoperative leucocytosis in extrauterine pregnancy. After a comparison, in individual cases, of the leucocyte

TABLE VII. THE LEUCOCYTE COUNT IN ECTOPIC PREGNANCY

90 cases with preoperative leucocyte count	100%
5-10,000 W.B.C.	44%
10-15,000	34%
15-20,000	8%
Over 20,000	14%

count, with the pathology found at operation, and also the preoperative temperature record, the conclusion was drawn that the leucocyte count is more misleading than it is helpful in the diagnosis of ectopic pregnancy. The reverse is true, however, for the erythrocyte counts. Table VIII shows that 75 per cent of all patients who received a preoperatvie erythrocyte count had a definite anemia of less than 3,500,000 erythrocytes. This is of definite diagnostic value where no great amount of external hemorrhage has occurred, and no prolonged suppurative process has been present.

Sedimentation rate: The blood sedimentation rate was unfortunately done in only 10 cases out of 104. It would be incorrect to base any conclusions on this small

TABLE VIII. THE ERYTHROCYTE COUNT IN ECTOPIC PREGNANCY

88 cases with preoperative erythrocyte count	100%	
1.5-2.0 million R.B.C.	7%	
2.0-2.5	19%	
2.5-3.0	26%	75%
3.0-3.5	23%	
Over 3.5	25%	

number. Out of 10 sedimentation rates performed, 6 were faster than 30 mm. in sixty minutes. Each of these 6 cases was found to be grossly ruptured at operation.

Scheffey, Morgan and Stimson[2] conclude that "the chief value of a sedimentation rate is to differentiate an unruptured ectopic pregnancy from pelvic inflammatory disease. In a ruptured ectopic pregnancy the sedimentation rate is as rapid as in pelvic inflammatory disease."

Biologic test for pregnancy: Not a single patient in this series received a biologic test for pregnancy. Goldberger, Salmon and Frank[4] in a recent paper, showed their results with the Friedman test in extrauterine pregnancy, in which 32 per cent of all cases gave an incorrectly negative test. They conclude that the test is of value only when positive; a negative test has no value in extrauterine pregnancy.

Colpotomy: A posterior colpotomy or needle puncture was performed on 19 patients, or 18.2 per cent of the total. Blood clot or fluid was obtained in every case, and each proved to be a bleeding ectopic pregnancy. This substantiates the value of the procedure in all questionable cases, and its more frequent use would no doubt have materially lowered the percentage of missed diagnoses in this series.

CONCLUSIONS

1. The incidence of missed diagnoses in ectopic gestation can be materially lowered by an evaluation of all clinical and laboratory findings in each case, always keeping in mind the possibility of an ectopic pregnancy.

2. The mortality rate of ectopic pregnancy can be lowered by a more accurate diagnosis and prompt treatment.

3. Laparotomy is the treatment of choice.

4. There is no unfailing history, symptom, or sign in ectopic gestation.

5. The erythrocyte count is as important as the leucocyte count in this condition.

6. Every gynecologic diagnosis where the erythrocyte count is less than 3,500,000 per c. mm. should include the possibility of extrauterine pregnancy.

7. A posterior colpotomy or needle puncture is of great diagnostic value.

Grateful appreciation for assistance in preparation of this paper is extended to various members of the gynecologic staff of the Philadelphia General Hospital, and to Dr. Charles A. Behney.

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THE STATUS OF BIOMETRY IN ENDOCRINE DIAGNOSIS

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WHEN Pierre Marie, in 1886, described anatomic changes produced by pituitary disease, he confirmed clinically John Hunter's contention that "structure is the ultimate expression of function." In the same decade, Sir Francis Galton established the use of statistical methods for the study of biologic problems. Since then, the phenomenal rise of endocrinology has focused medical interest on the body form, and biometrics has earned an important place in biologic research. As physicians became increasingly familiar with certain abnormal forms and recognized their association with specific endocrine disturbances, or with glandular syndromes, it followed naturally that many efforts were made to replace this observational and descriptive knowledge by a more precise quantitative technic.

Few researches have seemed so promising initially as these efforts to provide a clinical yardstick for the measurement of man in health and disease. Yet it cannot be denied that the arduous, persistent, and repeated labors of the biometricians have added surprisingly little to the scientific study of abnormal body forms or to their earlier detection. This paper proposes to discuss briefly certain features of the statistical attempts which may have a bearing on their failure and which may have the positive virtue of indicating another and more feasible approach.

* * * * * * *

Quantitative methods for the study of mankind through physical measurements, though many and diverse, have but two major objectives. First, from measurements of individuals to arrive at mathematical groupings, and hence at generalizations concerning man in the mass. Second, to develop a quantitative technic for the purpose of adding to our knowledge of men and women as individuals.

The first objective does not lie wholly in the realm of medical science. Anthropology has a primary claim. Indeed, this use of the statistical method has proved a perfect tool for anthropology. Physical anthropology owes its existence to the technic of anthropometry.

Medicine has tried to apply the same methods in much the same way and to a similar purpose. The medical objective has been to prepare various "panels" of typical form and function. Against this background of "biotypes" it hoped to isolate the individual, or patient; to

identify, to classify, and to study him with instruments of mathematical precision, borrowed from the technic of physical anthropology but renamed *biometry*.

But the attempt to classify mankind into definite physical and constitutional types has not been conspicuously successful. Although this endeavor has intrigued medical minds from the time of Hippocrates, and before, the clinical evidence, admittedly inexact and circumstantial, has hardly been improved by the labors of biometricians. Various measurements have produced only a variety of designations. Compare such types as the asthenic and hypersthenic, "Hochwuchs" and "Breitwuchs," hyperontomorphs and meso-ontomorphs, herbivorous and carnivorous, vegetative and animal, linear and lateral. It is evident that only the labels have been changed. The pigeonholes are the same.

The addition of further measurements, and hence of more complicated panels, has resulted in confused backgrounds, without adding anything useful in the evaluation of clinical problems.

No one will dispute the assertion that this use of biometry has not served medical science as handsomely as anthropometry has served its parent science. When we inquire into this difference, we find that it lies in the fact that the precise knowledge gained from the use of statistical methods pertains to the group and to the group's attributes, and not to the individuals who compose the group. Anthropology—"the science of man"—deals with the individual only as a member of a group. The anthropologist is satisfied to compare groups, whereas the physician desires group statistics (or panels) only for the purpose of diagnosis; that is, for predicting the condition of an individual.

The essential difficulty of such groupings, from the clinical viewpoint, has been that groups derived from few and simple measurements are too inclusive, and those derived from complex measurements become hopelessly involved, overlapping, and inconclusive.

The second objective of the statistical method is represented by such measurements as those of height and weight, stem length, head circumference, chest circumference, etc. These standards were raised through the measurement of large numbers of individuals already classified as to age, sex, race, geographic distribution, general health, and nutrition. Despite their admitted deficiencies when applied to the individual for the purpose of deciding his "normality," the value of such measurements cannot be questioned. Can they be elaborated sufficiently to be utilized in the diagnosis of constitutional and endocrine diseases? Before we answer this question, several facts must be considered.

Standards of this nature are of value only to the extent that they are the measures of a specific and significant trait. Obviously, the most specific measurements are single measurements, such as height alone or weight alone, but these are of slight significance. A combination of

height *and* weight measures is somewhat more significant, and still greater significance is achieved by introducing age into the equation (age—height—weight ratio). The introduction of relationship results from the endeavor to obtain significance. But past a certain point relationship measures become complex, and finally lose sight of their objective entirely.

Several such unwieldy methods have been offered to the medical profession. These misconceptions result in stillborn offspring which become embalmed in the voluminous literature of biometrics.

The limitations of the statistical method are not alone responsible for this failure. If this instrument (valuable in other fields of medicine or allied to medicine) has not been adapted to the direct detection of abnormal body forms or to their more critical study, it must be apparent that the reason for this must lie in the subject also.

From this standpoint, the failure of statistical methods to provide an accurate classification of endocrine or constitutional "biotypes" may be attributed to the fact that there are no *typical* endocrine or constitutional disturbances of the body form.

Hereditary abnormalities have a natural tendency to die out and disappear from the population. Chances for survival, in the generic sense, of the constitutionally inferior person are actually poor, and relatively (that is, compared with the normal person's) almost negligible. Hereditary types or races of constitutionally or endocrinologically abnormal persons simply do not exist.

Also, abnormal forms are not characteristic of specific growth disturbances only, but are determined to a very great extent by the time in the epigenetic development of the individual at which the growth disturbance happened to occur. For example, chondrodystrophy fetalis and rickets are caused by the same factors operating at different stages of endochondrial growth. The cretin, the hypothyroid and the myxedematous person differ greatly through the same endocrine disturbance occurring at various stages of development.

Conversely, different causes may produce similar abnormalities of form. It is stated, for instance, that "syringomyelia may give rise to the typical clinical and anatomic features of acromegaly" (Fischer, quoted by Swale Vincent). Precocious puberty of pituitary, suprarenal, and ovarian origin cannot be differentiated by means of the altered body form.

So-called abnormal "types" are, therefore, only deviations of form produced by various circumstances which, among other things, interrupt the normal evolution of the bodily symmetry. This leads us to conclude that no system of measurements can resolve the abnormal body forms into an etiologic pattern, or determine by the application of normal standards the causative factors of disease.

The precise knowledge furnished by biometrics can be of clinical value, but only indirectly, when guided by preliminary research to the measurement of a specific and important trait.

* * * * * * *

In the past nine years, in the Endocrine Clinic of the Mt. Sinai Hospital, under the direction of Dr. Robert T. Frank, I have had an opportunity to determine the proportions of a large number of individuals exhibiting various endocrine and constitutional disturbances. Thorough clinical and laboratory findings were available. In a paper published in 1932, I reported a statistical classification of a certain part of this material, and attempted to coordinate the statistical groupings with the clinical and laboratory findings.

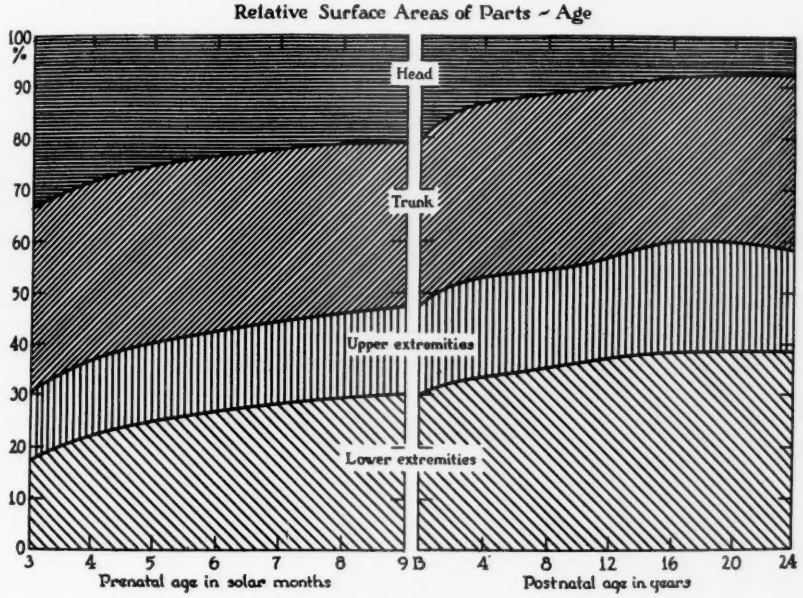

Fig. 1.—Proportionate parts of the surface area of the body. (From *E. Boyd*, The Growth of the Surface Area of the Human Body.)

While a certain degree of relationship was observed, it soon became evident to me that the results, discounting their value as basic data, did not justify the efforts expended on obtaining them. This disillusionment led, for one thing, to a critical review of statistical methods as applied to diagnosis of constitutional and endocrine disturbances, and so to the conclusion that no system of measurements can be applied directly to the diagnosis of endocrine or constitutional disease.

As a further consequence, these data are being reorganized solely on the basis of the age progression of the bodily proportions.

Exact studies have indicated that the proportions of the principal divisions of the body (head, trunk, arms, hands, thighs, legs, feet) are

remarkably constant, when deviations produced by age and sex are taken into account. An almost perfect inverse relationship exists between head proportion and age. Measurements of over 400 children six to fourteen years of age (Kiddie Keep Well Camp, Middlesex County, New Jersey) place the coefficient of this correlation at −0.861. The age progression has been studied from the fetal period (Klein and Scammon) through postnatal development (Meeh, Putiloff, Pfaundler, Kastner, Bardeen, Wörner, Berkow) (Fig. 1).

The abnormal forms are considered without reference to their causation, merely as interruptions of the normal time-sequence in the evolution of the body's architecture. The following examples illustrate this use:

CASE 1.—J. C., female, cretin, twenty-five years of age. Proportions (per cent): head 10.4, trunk 40.5, upper extremities 16.2, and lower extremities 32.4 (thighs 15.3, legs 10.4, feet 6.7). These proportions are normal for a seven-year-old child. J. C. would therefore be considered, from her body proportions, as a case of arrested development in childhood (aged seven). This contrasts with the earlier classification of "typical cretin," which our data did not justify. Mongols, for instance, show a similar arrest of development in surface area proportions.

CASE 2.—D. M., female, aged eighteen, primary amenorrhea (pituitary neoplasm). Proportions: head 8.0, trunk 33.1, arms 14.0, hands 4.3, thighs 19.8, legs 14.0, and feet 6.4. Classification from proportions: development arrested at eleven to twelve years of age (prepubertal proportions).

TABLE I

ABNORMAL DEVELOPMENT	TIME
1. Arrested	Neonatal cycle
2. Retarded	
3. Accelerated	
4. Precocious puberty	Juvenile phase
5. Absent	Pubertal cycle
6. Delayed	
7. Heterosexual (Not represented in disturbed proportions)	Adult phase
8. Mixed forms	
9. Retarded growth, with normal proportions	
10. Accelerated growth, with normal proportions	

In the present classification, normal proportions are used as a physiologic time-table through which we can determine the time of origin of the abnormal body forms, that is, the period of development in which the individual began to deviate from the normal proportions (Table I). Although the reorganization of our data has not been completed, it is safe to say that this quantitative knowledge, which can be derived from the measurement of a specific trait (the bodily proportions), is of some clinical importance.

GRANULOSA CELL CARCINOMA OF THE OVARY IN A CHILD OF THREE YEARS AND NINE MONTHS

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THE patient, P. H., entered the hospital on May 25, 1936, at which time she weighed 46 pounds, was 42½ inches in height, and three years, nine months, and eight days old.

The present illness began four days before entry with epigastric pain for which she received an enema without noticeable relief. A rather profuse, white vaginal discharge was then noticed for the first time. During the next three days the abdominal pain subsided and she developed progressive abdominal swelling and was brought to the hospital.

The patient was born spontaneously at term, Aug. 17, 1932, weighing 10 pounds, 3.5 ounces and measuring 22 inches in length. She was breast fed for six months and received supplementary feedings of S. M. A. during this time. She did not

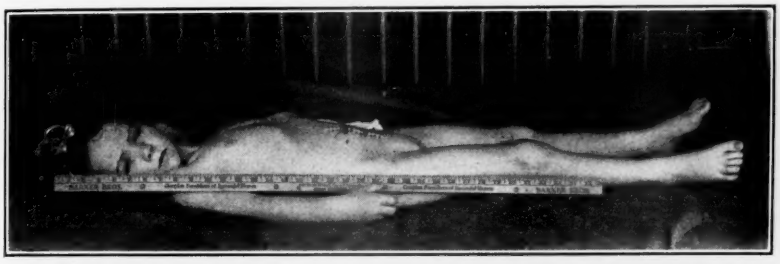

Fig. 1.—Photograph taken three days postoperatively, showing the length of the patient 42½ inches, average height of child at five years.

gain very rapidly at first, and at eighteen months of age, her parents felt that she was smaller than normal. During the last year she has grown quite rapidly, especially during the last six months. In February, 1936, the child was taken to the family physician because her breasts appeared larger than normal; this was not very noticeable, however, until she had measles, during the latter part of March. Since then her breasts have increased in size rather rapidly.

Physical examination revealed a very well-developed and well-nourished white child of stated age, having above average intelligence and having the facies of a child at puberty or older. The abdomen was markedly distended and there was dullness over the dependent portions with a shifting area of tympany. A fluid wave was palpable. Peristalsis was active and borborygmi were present. Rectal examination failed to reveal fecal impaction, the cervix and uterus felt larger than normal, and there seemed to be an indefinite mass on the left side of the pelvis. The external genitalia were larger than normal, and there was a moderate amount of white vaginal discharge. Pubic and axillary hair were absent.

At this time a tentative diagnosis of granulosa cell carcinoma was made. As the patient was not improving under conservative management and appeared definitely worse on May 26, immediate operation was performed. Through a lower

right paramedian incision the peritoneum was opened and 3,500 c.c. of serosanguineous fluid aspirated, whereupon a tumor measuring approximately 10 cm. in diameter was found attached by a pedicle to the left adnexal region. This mass, apparently a tumor of the left ovary, was very friable, had many hemorrhagic areas and a tear in the upper portion of its capsule. The pedicle of this tumor was clamped close to the uterus, and the tumor and the left fallopian tube were removed. The other ovary was inspected and appeared normal except for several small cystic areas. The uterus was enlarged to about the size expected at puberty. There were no peritoneal transplants and the regional lymph glands were not enlarged. The abdomen was closed without drainage.

The patient made an uneventful convalescence. On the third postoperative day a bloody vaginal discharge was noted for the first time.

The urine was entirely negative except for a two-plus sugar, undoubtedly due to intravenous glucose. The red blood count was 4.93 million, the hemoglobin 70 per cent, the white blood count 10,500, and the differential count was: polymorphonuclear neutrophiles 71 per cent, lymphocytes 18 per cent, monocytes 4 per cent, metamyelocytes 10 per cent. On May 25, a barium enema failed to reveal any evidence of organic disturbance. Films taken of the lung fields and sella turcica on June 9 were also negative for evidence of pathology. Through the generous courtesy of Betsy McKennon and Samuel Glass of the Hormone Assay Laboratory, estrogenic hormone tests were made as follows:

DATE	NUMBER OF C.C. OF URINE	MOUSE UNITS OF ESTRIN	MOUSE UNITS OF ESTRIN PER 100 C.C.
5/26/36	23	400	1739
5/28/36	190	200	105
6/ 1/36	490	20	4
7/ 7/36	580	20	3
8/18/36	410	None	None
9/ 1/36	1040	10	1

Eight hundred and fifty-five cubic centimeters of ascitic fluid obtained at operation contained 5,000 M.U., and 80 gm. of the 255 gm. tumor contained 400 M.U.

The pathologic report was as follows: the specimen consisted of a tumor mass measuring 11.5 by 8 by 4.8 cm. and weighing 255 gm. Its external surface was smooth and consisted of a rather thin capsule which had been torn in several places. There were numerous dilated blood vessels just beneath the capsule and the surface varied in color from light gray and pink to dark brown. There were many soft apparently cystic areas, the larger of which measured 3.5 cm. in diameter. On cross-section, in daylight, the tumor was lemon yellow in color and contained numerous cystic areas which varied in size and shape. Certain portions were rather firm to palpation, the largest of which measured 9 by 6 cm. Other portions were much softer, even brainlike in consistency. In addition there were several small areas of hemorrhage and necrosis.

Microscopically, the general impression was that of a highly malignant, anaplastic growth, resembling a gland-cell carcinoma. Trabeculae of a very cellular type of fibrous tissue with spindle-shaped cells separated larger and smaller groups of the epithelial cells. The epithelial cells varied greatly in size and shape with cytoplasm which stained poorly and was not easily seen. The nuclei stained prominently and were of a vascular appearance with distinct chromatin granules, and many of the cells contained fairly prominent nucleoli. In shape the nuclei were round, oval, or of somewhat irregular outline. One feature of note is the immense size of some of the nuclei which were intensely hyperchromatic and contained

bizzare-shaped nucleoli. Mitotic figures were numerous. Microscopic study of the pattern of the epithelial groups gave the impression of a characteristic but vary-

Fig. 2.—Ovarian tumor showing the fallopian tube along right margin.

Fig. 3.—Tumor, bisected, showing numerous cystic areas with firm tumor tissue at the sides and necrotic tissue at the bottom.

ing arrangement. Most of the cell groups had a tendency to exhibit a follicle-like arrangement. These follicles were round, oval, or irregular in outline with a

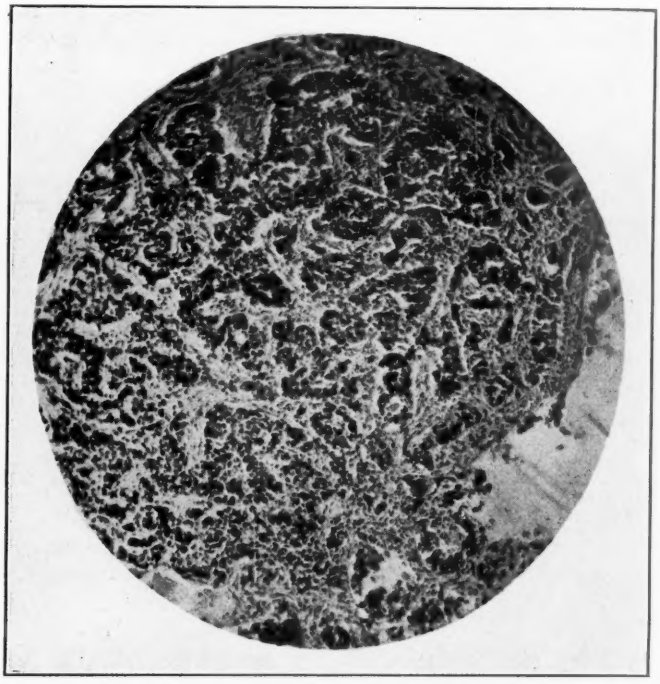

Fig. 4.—Granulosa cell carcinoma. Area showing cylindroid structure. ×70.

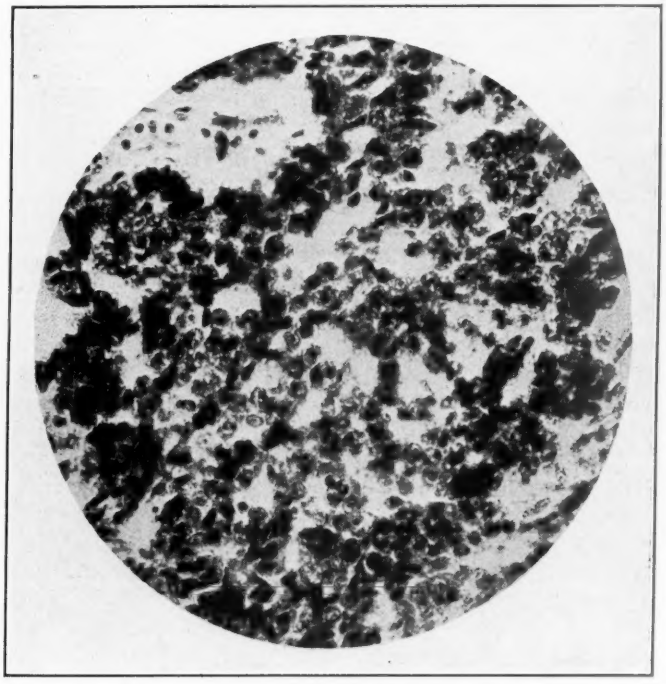

Fig. 5.—Granulosa cell carcinoma. Area showing folliculoid structure. ×260.

granular or homogenous content. The small follicle-like structures suggested the primitive graafian follicle. There were less numerous large cystlike openings with a fairly well-organized capsule, which may be compared with the developing graafian follicle. While the greater part of the epithelial groups have this follicle-like structure, some fairly large areas had a quite uniform distribution of the cells, an arrangement called by some "parenchymatous," by others "sarcomatous." A third fairly characteristic arrangement in some areas was that of a coarse network of cords or columns of the tumor cells interspersed with trabeculae of fibrous tissue. In certain areas there was extensive necrosis of the centers of the cell groups and in places rather large necrotic areas involving all of the tumor structures, and infiltrated with blood.

Tentative Diagnosis.—Granulosa cell carcinoma (Newton Evans).

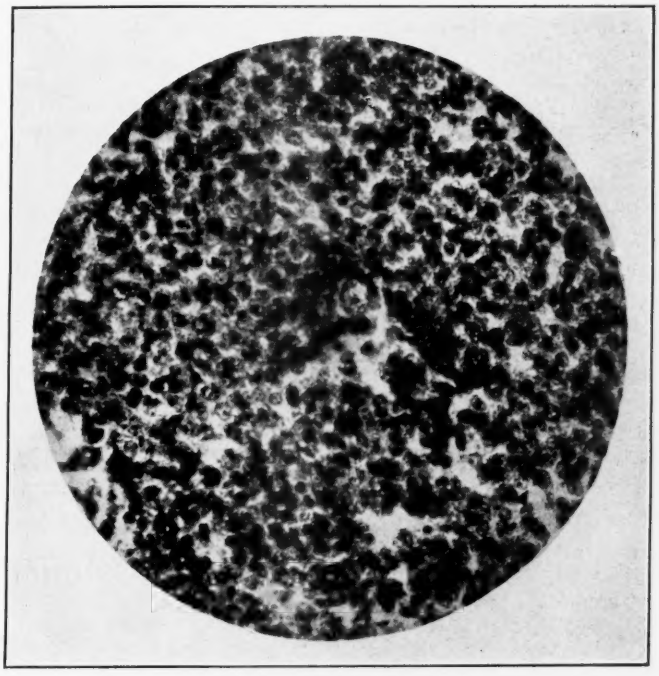

Fig. 6.—Granulosa cell carcinoma. Area showing parenchymatous or sarcomatous arrangement of the cells. ×220.

The patient was discharged from the hospital in good condition on the eighteenth postoperative day (June 13). During the following week she had a small amount of bloody vaginal discharge on one day only. The leucorrhea gradually decreased.

The patient received 900 roentgen units from June 22 to June 29 given in 150 roentgen unit doses daily at 184 K. V., 7 M. A. at 50 cm. through 0.5 mm. of copper and 1 mm. of aluminum.

The patient was followed in the outpatient clinic where it was noted that the breasts decreased to about one-half the former size. However, on August 13, several small nodules were palpated in the region of the right ovary, the largest of which was about 2 cm. in diameter. These nodules increased in size until the patient was re-admitted (Aug. 27, 1936). In spite of a recent negative estrin test of the urine, a laparotomy was performed and numerous metastatic nodules were

found in the pelvic and abdominal peritoneum as well as in the mesentery and omentum. The larger nodules in the pelvis as well as some in the region of the incision were removed. The mass of tumor tissue removed at the second operation aggregated a total diameter of 8.5 by 8.5 by 3 cm.

Microscopic: The tumor tissue from the pelvic masses resembled the structure of the ovarian tumor removed at the first operation. It differed, however, in several respects, particularly in the practically complete absence of follicle-like structures. The nuclei were large, the cells were arranged in large homogenous groups, resembling more the sarcomatous or parenchymatous type of arrangement. Many of the nuclei were extremely large and hyperchromatic.

Microscopic Diagnosis: Granulosa cell carcinoma (Newton Evans).

DISCUSSION

The tumor had apparently been present for at least five months, as the mother had consulted a physician about the breast enlargement during February. This would suggest that the tumor was rather slow growing and failed to produce symptoms other than abnormally rapid body growth and precocity (Fig. 1) until the episode of abdominal pain occurring four days before entry. This probably corresponds to the time of rupture of the tumor capsule, which was followed by a rather rapid onset of ascites which is found in only about 10 per cent of cases.[2] Spontaneous rupture of a granulosa cell carcinoma was found in only two cases[3, 5] by Thornton[6] and this was accompanied by bloody ascitic fluid in each case.

In a review of 150 cases Bland and Goldstein[1] found only 8 under the age of ten, the youngest being a patient of Clarence B. Ingraham and Chesmore Eastlake of Denver, reported by Novak,[4] a child three years and eleven months of age. This would place our case in the lowest age group as she was three years, nine months, and eight days old at the time of operation and precocious development had been noticed at least five months prior to this time.

Although estrogenic hormone tests on the blood would have been of value, it was thought inadvisable as the patient was in poor condition both preoperatively and postoperatively. In place of this the estrin content of the ascitic fluid and urine was tested.

The decrease of urinary estrin, in spite of a recurrence of the carcinoma, was rather surprising. The only explanation we can offer is that the x-ray therapy was probably sufficient to destroy part of the estrin-forming properties of the tumor but not sufficient to inhibit the growth of the cells.

Between Sept. 29, 1936, and Nov. 17, 1936, the patient received 4,900 roentgen units of x-ray at 200 K. V., 7 M. A. at 50 cm. through 0.5 mm. of copper, and 1 mm. of aluminum, which was given in 100 and 150 roentgen unit doses.

The patient died at home Dec. 20, 1936, and an autopsy was not obtained.

We are indebted to Dr. Newton Evans, Chief Pathologist of the Los Angeles County Hospital, for his assistance in the study of this case.

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URETEROHYDRONEPHROSIS RESULTING FROM PELVIC INFLAMMATORY DISEASE

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URETEROHYDRONEPHROSIS associated with neoplasms of the pelvic organs has been reported frequently. Pregnancy also has been stressed as an etiologic factor. Pelvic inflammatory disease, however, rarely has been found to be the cause of ureterohydronephrosis. The following unusual case is therefore presented.

CASE 384782.—R. K. The patient was a twenty-four-year-old American-born housewife. Her only pregnancy two and one-half years previously had ended in a stillbirth in the eighth month, following an injury to the abdominal wall. Her menses had always been irregular, the interval varying from three weeks to three months, the duration four or five days. Two years before admission to the hospital the patient noticed a vaginal discharge. Her physician informed her that she had "an inflammation in the pelvis." In the three months preceding admission to the hospital the patient suffered recurrent lower abdominal pain associated with occasional nausea and vomiting. During this time she had lost sixty pounds in weight. In the two months preceding her admission she had noticed urinary frequency and urgency with occasional incontinence.

Physical examination on admission to the hospital revealed a pale, obese, chronically ill-appearing young woman. Blood pressure was 110/70. The general examination revealed no abnormalities except a large, hard, lower abdominal mass appearing to arise from the pelvis and reaching to within one fingerbreadth of the umbilicus.

Pelvic examination showed a densely hard, irregular mass, reaching on the right almost to the level of the umbilicus and slightly lower on the left. The uterus and adnexa could not be identified separately from this mass. On rectal examination a definite obstruction to the finger was encountered two inches from the anal orifice. This was caused by a dense, hard, annular constriction infiltrating and fixing the rectovaginal septum completely. The mass was densely adherent to the pelvic walls and gave the impression that one was dealing with a "frozen pelvis" (Figs. 1 and 2).

Laboratory studies showed hemoglobin 80 per cent, sedimentation time fourteen minutes, white blood count 13,000 with 76 per cent polymorphonuclear leucocytes, and blood Wassermann four-plus on two occasions.

The diagnostic possibilities that presented themselves were: (1) a pelvic inflammatory process with perirectal constriction; (2) a pelvic malignancy, either primary or secondary; and (3) lymphogranuloma with perirectal infiltration. Further studies were undertaken to establish the diagnosis.

Barium enema revealed an irregular stenosis of the rectosigmoid ascribed to extrinsic pressure. It was impossible to pass the sigmoidoscope beyond the narrow, angulated rectum. Cystoscopy revealed the bladder capacity to be diminished to 160 c.c.; the bladder was distorted and appeared as an elongated, elevated, tubular structure with the trigone somewhat displaced to the left; both ureters were catheterized to the kidney pelves, and there was retention of 14 c.c. on the right and

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12 c.c. on the left; microscopic examination of the specimens obtained was negative; indigo carmine appeared in fair concentration in six minutes from the left side and rather weaker from the right; urine cultures were negative. Phenolsulphonephthalein excretion showed less than 10 per cent in four hours. The blood urea nitrogen was 9 mg. per cent. Repeated concentration tests showed definite, marked impairment of function, inability to concentrate above 1.010. Intravenous pyelography showed definite marked bilateral ureterohydronephrosis, the calyces being particularly distended and the upper portion of each ureter similarly involved (Fig. 3). The Frei test was negative.

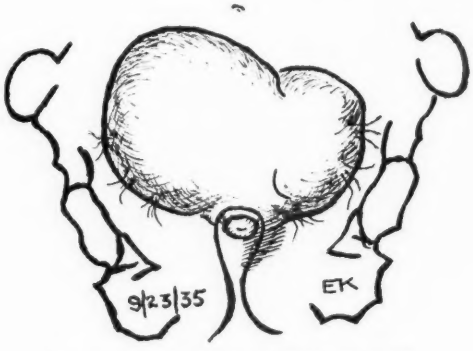

Fig. 1.—Pelvic findings Sept. 23, 1935.

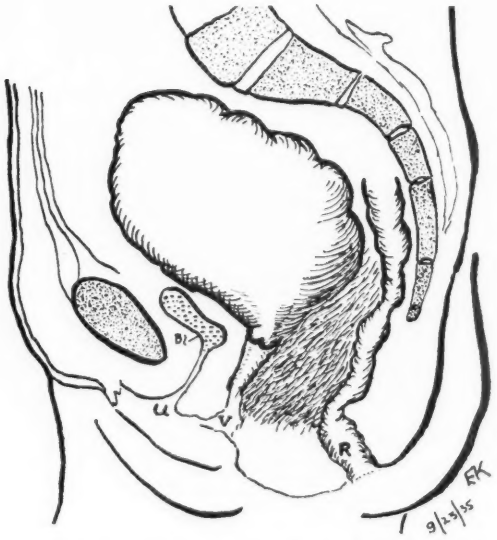

Fig. 2.—Pelvic findings Sept. 23, 1935.

DISCUSSION

The medical consultants were of the opinion that the severe impairment of renal function was due to ureteral compression, on a mechanical basis, and that there was no primary parenchymal lesion of the kidney. The evidence of impaired renal function and the dilatation of the upper urinary tracts appeared due to the pelvic inflammatory process. Under

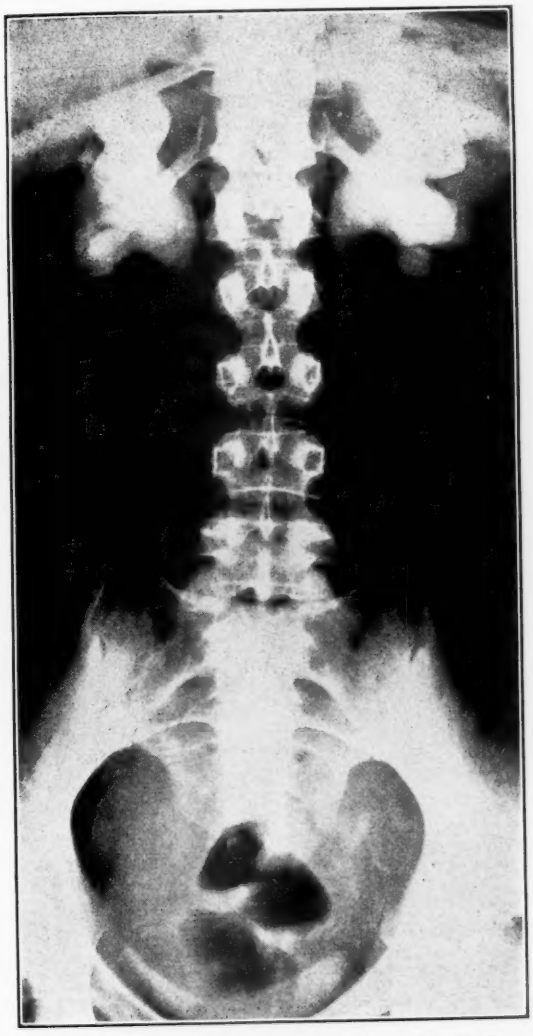

Fig. 3.—Intravenous pyelogram April 17, 1936.

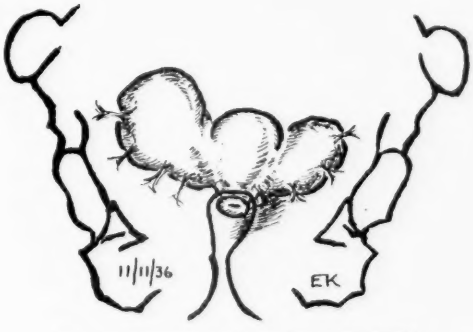

Fig. 4.—Pelvic findings Nov. 11, 1936.

observation the pelvic mass showed some tendency to diminish in size. Because of this and in view of the impaired renal function, it was considered wiser not to attempt intervention, which necessarily would be hazardous, but to treat the patient conservatively. Accordingly, antisyphilitic therapy was instituted and the patient has been closely followed during the past sixteen months.

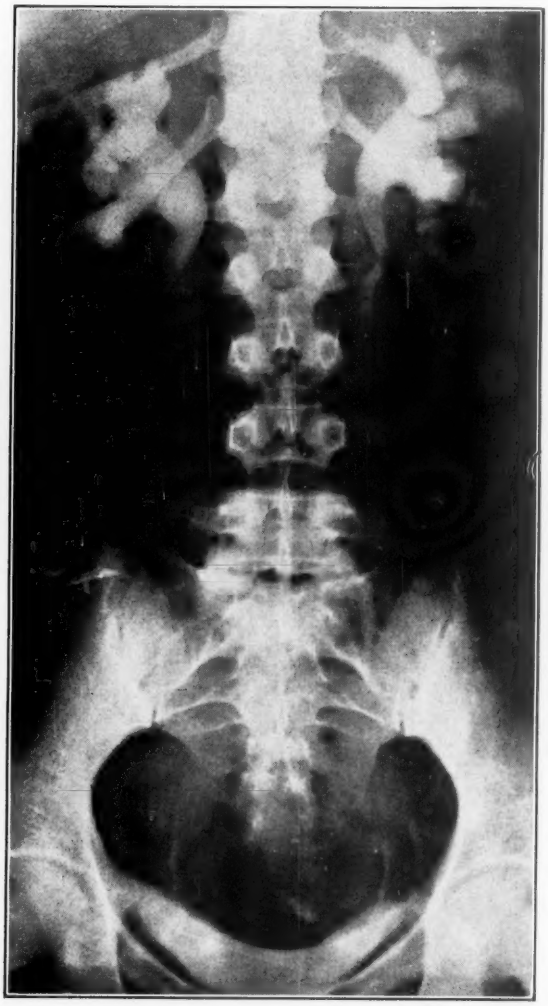

Fig. 5.—Intravenous pyelogram Feb. 10, 1937.

During this period there has been a marked improvement in the patient's condition. She has gained weight. Her hemoglobin has risen from 60 per cent to 88 per cent. The sedimentation time has increased from fourteen minutes to one hour, twenty minutes. Phenolsulphonephthalein test shows more than 30 per cent of the dye excreted within four hours. A concentration test now shows that kidney function has

markedly improved, as evidenced by the ability of the kidney to concentrate up to 1.018 in comparison with the previous level of 1.010. A normal-sized uterus with bilateral adnexal masses can now be felt. The pelvic mass has diminished in size though the infiltration of the rectovaginal septum still persists. The pelvic mass is now somewhat movable in comparison with its previous dense adherence to the pelvic walls (Fig. 4). Intravenous pyelogram (Feb. 10, 1937) shows a definite decrease in the ureterohydronephrosis particularly on the left side (Fig. 5).

It has been interesting to follow this unusual complication in a common disease and to note the improvement under a conservative regime.

69 East 90th Street

Courtois, J., Longuet, A., and Lecoq, R.: The Rôle of Avitaminosis in Coli Bacillus Infections of Pregnancy, Gynécologie (Paris) **35:** 216, 1936.

According to the authors disturbances in the female sex hormones predispose to acidosis. The presence of vitamins in general and vitamins A and B in particular plays a very important rôle in pregnancy. Lack of vitamin A increases the tendency to acidosis. The absence of vitamin A diminishes the defense of the villus epithelium and favors infection, particularly infection due to the colon bacillus. Exogenous and endogenous factors may also result in colon bacillus infections during pregnancy. The exogenous factors usually arise in the alimentary tract. Alkalosis like acidosis may favor the development of a colon bacillus infection, but alkalosis is extremely rare in a pregnant woman whereas acidosis is unusually common. With this knowledge it is easy to overcome colon bacillus infections during pregnancy. The means consist of overcoming alkalosis or more commonly acidosis by the administration of phosphoric acid or sodium bicarbonate. Likewise, there must be an abundant supply of vitamins A and B. In some instances saline injections are necessary and in others a serum or vaccine may help.

J. P. Greenhill.

Kraus, J.: Diabetes Mellitus and Pregnancy, Med. Klin. **32:** 375, 1936.

Before the advent of insulin a pregnancy in patients with diabetes mellitus was rare, because of severely regressive changes in the follicle apparatus of the ovaries which led to amenorrhea and sterility. The probable cause for this is diminished function of the hypophysis.

In most cases the diabetes antedates the pregnancy. First appearance of diabetes during pregnancy is rather uncommon. Before the introduction of insulin, pregnancy was a serious complication of diabetes.

During the latter part of pregnancy, there is less danger from diabetes but there is an aggravation again after labor and during the puerperium.

Since the use of insulin the maternal mortality has dropped from limits between 27 and 55 per cent to 17 per cent. One danger of insulin is hypoglycemic coma. In spite of insulin the fetal death rate still is about 43 per cent. Furthermore, a large proportion of these children die during the first few weeks of life. Many children born of diabetic mothers are overweight which is due to the hyperglycemia of the mother. When insulin is used most of the babies have a normal weight.

J. P. Greenhill.

MASSIVE PUBERTY HYPERTROPHY OF THE BREASTS

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RECENT hormone studies relating to the physiology of breast development have stimulated renewed interest in the etiologic factors responsible for certain pathologic alterations of that organ. Among these aberrations, the massive enlargement of the breasts seen in puberty hypertrophy is particularly striking. Such a case in a fourteen-year-old girl is presented, with a description of the pathologic anatomy and a discussion of its probable hormonal relationship.

As is well known, the female breast may show normal and rather wide variations in size at any age after puberty, depending upon the individual, the presence of a gravid state, lactation, or obesity. Infrequently, enormous hypertrophy may develop, the breasts in some instances reaching almost to the knees. This abnormal growth has been variously termed virginal, puberty, puberal, massive diffuse, or nongravid hypertrophy. Although cases have been described with the onset at a mature age or during pregnancy, they are usually seen at puberty, shortly before or after the menarche. Enlargement may continue with a varying degree of velocity from several months to two years. The first case was recorded by Durston[7] in 1669, in which the left breast weighed 64 pounds and the right 40 pounds, the greatest hypertrophy yet reported. On the average, however, a single breast approximates seven to ten pounds in weight. Bilateral involvement is usual, and slight differences in size not infrequent. The hypertrophy is diffuse, giving rise to enormous, pear-shaped organs. The rapid expansion results in a thinned skin, flattened nipples and enlarged areolae. Local circulatory disturbances are the rule, and include distended, tortuous, superficial veins, chronic edema and a tendency to ulceration of the skin. The gross and microscopic features described in the case reported are representative.

CASE REPORT

P. G., a fourteen-year-old girl, was first admitted to the Endocrinological Clinic of Dr. R. T. Frank in February, 1936, because of excessive enlargement of the breasts. Her birth and childhood development had been normal in all respects. Menstruation began at the age of thirteen, sixteen months prior to admission. The menses recurred regularly, at first every twenty-one days, and later every four weeks for three to six days. The flow was moderate, without dysmenorrhea. Before the onset of the menarche the breasts were described as not different from those usually observed in early puberty. With the beginning of the menses, however, both breasts rapidly enlarged and reached their maximum size at the end of four months. From

then until the time of examination, one year later, there was no increase in size, but rather a lengthening and narrowing of the breast pedicles. The patient experienced a dragging sensation in the chest and a feeling of tenseness without pain. The child was disturbed mainly because of the unsightliness of her figure. During the last few months, small ulcerations appeared at the site of the constricting bands of a specially constructed breast support. These healed slowly. No subjective changes were experienced during the premenstrual or menstrual phase. Five months before admission she received four x-ray treatments to the breasts at another hospital, without, however, any apparent improvement. The family history revealed no evidences of any unusual breast abnormalities. The past history was negative.

The general appearance, aside from the local condition, was that of a bright, well-proportioned young girl of fourteen years. No deviations from the normal were noted somatically. Both breasts showed extreme, pear-shaped enlargement down to below the level of the umbilicus (Fig. 1). There was some asymmetry, the left being larger than the right. The areolae appeared enlarged, and the nipples inverted.

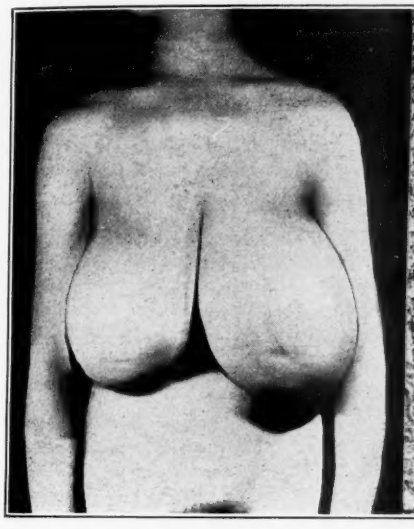

Fig. 1.

Fig. 2.

Several distended superficial veins were seen to course from the base of the mamma. Palpation revealed a moderately firm and uniform consistency.

Anthropometric measurements were essentially normal. The height was 60½ inches and the weight 114 pounds. Hematologic studies were entirely negative. Urine examination revealed no abnormalities. The basal metabolism was −15 per cent. X-ray examination of the sella turcica showed it to be normal in size and shape. The blood Wassermann test was negative.

In March, 1936, the patient was admitted to the Surgical Service of Dr. H. Neuhof. A bilateral simple mastectomy was performed in two stages. It was thought unwise to attempt preservation of the nipple area. Instead, a small, conical portion of the breast tissue was retained on each side to form the basis of two small, artificially constructed breasts. Healing proceeded uneventfully with an excellent cosmetic result.

The resected breasts were similar in appearance. The left weighed seven, and the right, four pounds. Beneath the thin, stretched skin, several, large distended veins were apparent. Practically no fat tissue was present. The hypertrophied

breast was composed of firm, white, fibrous tissue, divided by thin septa into lobes of varying size. The gross impression was that of a diffuse overgrowth of all elements of the breast, but especially of the fibrous tissue component. Some portions appeared softer and more edematous than others. Scattered, punctate, translucent areas corresponded to the epithelial structures within the connective tissue matrix. No distinct, encapsulated fibroadenomas were noted, although these have been described not infrequently in puberty hypertrophy.

Microscopically, there was marked hyperplasia of the duct and lobular structure and surrounding connective tissue stroma. The individual lobules represented a stage of development which could be classified as unripe, compared with that seen in the normal adult, and corresponded to the picture usually encountered at the age of puberty (Fig. 2). The lactiferous ducts were large, elongated and lined by epithelium in two layers. Within the lobules the terminal ducts appeared slightly dilated. Fine divisions of the ductules, either as blunt, clublike, solid thickenings or partially opened alveoli could be seen. These, however, were relatively infrequent, in conformity with the picture normally encountered at the patient's age, in early lobular development. The distribution of glandular elements was not entirely uniform, being numerous in some areas and sparse in others. The interlobular connective tissue, composed of coarse, collagen fibers, seemed particularly abundant. Moderate edema and vascularity were present. A distinct differentiation existed, for the most part, between the inter- and intralobular stroma. The latter (the mantle connective tissue immediately about the clusters of ductules, epithelial buds and acini) contained fine collagen fibers and appeared more cellular and loosely arranged, with occasional lymphocytes.

Endocrinologic Studies.—The following studies were performed in the Endocrine Research Laboratory. Ten grams of the hypertrophied breast tissue were extracted for female sex hormone and found negative. An assay of 15 gm. of the tissue did not show the presence of gonadotropic hormone. Examination of the entire urinary excretion over a period of one month for the anterior pituitary gonadotropic factor revealed no abnormal findings. The total urinary excretion of female sex hormone in twenty-four days was determined at 1,720 mouse units, which is within the limits of normal. A study of daily vaginal smears through a month's cycle showed no abnormal features.

DISCUSSION

An evaluation of the factors that might possibly be responsible for the massive hypertrophy illustrated in this case must take the following into consideration: (1) the histologic and pathologic changes occurring in normal breast development with special reference to the time of puberty, (2) the relationship of various hormones to growth of the breast.

At birth both the male and female breast contains an elementary system of large ducts with some branching, but no lobule or acinus formation. From birth to puberty there is a period of relative quiescence, growth being limited mainly to an elongation of the ducts (Loeb[25]), with only moderate division, sufficient to keep pace with the general development of the body. With puberty in females, the mamma receives an added impetus and there follows a rapid and progressive dichotomous division of the milk ducts. The terminal portions especially show numerous solid, epithelial buds which become hollowed out into small tubules, and

then lengthen to form further subdivisions. Thus, a definite lobular structure composed of branching small ducts and finely calibred ductules is formed. There is an absolute and relative increase in both the loose, mantle connective tissue which ensheathes the duct system and in the general supporting stroma of the breast. The terminal end portions of this arborized system may be lined by a single or double layer of epithelium. They are, however, distinctly different from the single layered, dilated acini in the lactating lobule. According to Dieckmann[6] the increase in size and complexity of the lobule continues until the "adult lobule" is produced. The extent and rate at which this takes place varies with the individual and accounts for the variety of pictures encountered at any particular age. Occasionally it may remain at a more infantile level, comparable to infantile genitalia. The quantity of fat tissue within the breast is another variable factor. It becomes especially evident after the onset of puberty and increases with general body adiposity. After mature mammary growth is reached, aside from those changes induced by pregnancy and lactation, the lobular structure remains permanent until menopausal regression ensues.

That a relationship exists between breast development and ovarian function has been recognized for many years. The failure of the breasts to develop following prepubertal complete gonadectomy, and their atrophy after the menopause and operative or x-ray castration pointed in this direction. Grigorieff (1897), Halban[19] (1900) and Knauer[23] (1900) confirmed this view by their successful implantation of ovarian tissue in young castrated animals, with resultant breast development. Steinach[32] also was able to induce mammary growth in male guinea pigs by ovarian transplantation. In the past few years extensive experimental work has indicated that the estrogenic and corpus luteum hormones are responsible for the growth of breast tissue and that the prepituitary lactogenic hormone is concerned with milk secretion.

When oophorectomized, adult virgin rabbits are stimulated by injections of female sex hormone there results an extreme overgrowth and ramification of the ductal system of the breast with practically no acinar growth, the pattern resembling that of a barren, branching tree (MacDonald[27]). If, however, the estrogenic hormone in combination with progestin is used, both a ductal and acinar overgrowth occur, giving rise to well-developed gland lobules with numerous alveolar outbranchings from the terminal ductules. The employment of a corpus luteum hormone alone has no effect. Hypertrophy of the breast with growth of the duct system after the injection of estrin has been noted by numerous investigators in the male cat, the male guinea pig (Turner and Gomez[34]), castrated rabbits and guinea pigs (Gardner, Gomez and Turner,[15] MacDonald[27]), and mice (Gardner, Smith and Strong[16]).

To prove that the ovarian hormones acted directly upon the breast and not through the anterior pituitary gland, Asdell and Seidenstein[1]

treated hypophysectomized and intact castrated rabbits with estrogenic and corpus luteum hormone. Similar breast development resulted in both groups. Using hypophysectomized and intact male guinea pigs, Nelson corroborated the above findings. Male rabbits previously treated with theelin show a definite increase in size of the breast after the injection of the galactopoietic hormone. This, however, is not due to any further growth of the ductal system, but rather to the distention of the preexisting system with secretion. In intact male or ovariectomized female guinea pigs, the use of the ovarian hormones not only causes mammary development, but on their removal initiates the onset of lactation (Nelson[29]). He believed that the removal of the inhibiting influence of the estrogenic hormone on the anterior pituitary lobe permits the lactogenic hormone to act. In hypophysectomized guinea pigs, however, this effect is not obtained, nor will lactation continue in animals after the hypophysis is removed. The dependence upon the pituitary gland for initiation and maintenance of lactation is thus indicated.

The convincing experimental evidence of the direct dependence of the breast upon the ovarian hormones for growth permits a correlation of the normal stages of human breast development with the endocrine studies already made. In early childhood, when the undeveloped breast is quiescent, Frank has found little or no pituitary gonadotropic or female sex hormone in the blood or urine. At puberty or prepuberty a cyclic excretion of estrogenic substance has been demonstrated by Frank[8] and by Fluhmann,[13] though definitely less than in the mature woman. In one nine-year-old girl, four mouse units per liter of urine were found. In another twelve-and-one-half-year-old girl, one-half the adult amount of female sex hormone was recovered two and one-half months before the menarche. At this time the previously rudimentary mamma shows pronounced growth activity in the glandular tissue and surrounding stroma. In the normally menstruating, maturing girl definite blood and urinary cycles of gonadotropic and female sex hormone are present, and the breast shows a lobular structure which slowly increases in complexity until the adult stage is reached. After the complete menopause the quantity of estrin falls markedly and breast atrophy ensues. During pregnancy when the increase in estrin, progestin, and the pituitary hormones is marked, there is a proliferation of the acini and dilatation of the ducts in addition to the lactogenic effect. In two cases of precocious puberty, due to the presence of a malignant ovarian tumor, female sex hormone was recovered from the urine (Frank[8, 10]). These children showed premature development of the secondary sex characteristics, including enlargement of the breasts. Heidrich and his coworkers[20] report a case of teratoma of the testis with gynecomastia. Two hundred and fifty mouse units of female sex hormone were obtained from a liter of urine, and 35,000 mouse units of gonadotropic hormone.

Geschickter, Lewis and Hartman[17] interpret the histology of gynecomastia, puberty growth and puberty hypertrophy as being similar. They have produced a typical picture of gynecomastia in the monkey (rhesus macacus) by injections of female sex hormone.

The weight of evidence points to the conclusion that virginal hypertrophy is an exaggeration of the normal growth changes seen at puberty, that the direct stimulus for breast enlargement at this time is derived from the estrogenic and possibly also the corpus luteum hormone, and finally that these ovarian hormones are concerned in the etiology of massive hypertrophy. In the present case the endocrine studies were normal. It is to be noted, however, that they were done one year after the breasts had apparently stopped growing, so that no definite interpretation can be made. It has been pointed out that the technic of our present methods for the quantitative estimation of certain hormones, though much improved, is at best rather crude. There are several endocrine secretions which cannot be measured or are measured with difficulty. Further, one cannot evaluate the effect of such possible factors as small increases in the circulating hormones over varying periods of time, large increases over shorter intervals, the renal threshold and the local response of the tissues involved.

SUMMARY

A case of puberty hypertrophy of the breasts in a girl of fourteen years is described, including endocrinologic studies. The pathologic anatomy indicates a marked hyperplasia of the glandular and connective tissue elements with preservation of the unripe lobular structure ordinarily encountered at puberty. The hormonal factors responsible for mammary growth are discussed and a correlation made with normal physiologic development of the breast. The weight of evidence indicates that the estrogenic hormone and possibly also the corpus luteum hormone is directly responsible for growth of the breast and is concerned in the etiology of puberty hypertrophy.

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TRUE HERMAPHRODITISM IN MAN, WITH AN ENDOCRINOLOGIC STUDY*

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TRUE hermaphroditism in man is relatively rare. There are many cases recorded in medical literature but only a few can be considered as true proved cases according to the requirements laid down by earlier authors. The proof of true hermaphroditism rests in the demonstration of both ovarian and testicular tissue. Gross evidence is not sufficient, both tissues must be identified microscopically. The gonads need not be present as separate structures, they may be combined as one single body, the ovotestis.

Kwartin and Hyams[1] in 1927 made a critical review of the literature and reported a case of their own, bringing the total number of instances of true hermaphroditism in man up to twelve. Their report included the material presented by Young[2] in 1933 where he repeated the total figure as twelve in the world's literature. Later in 1933 Stojalowski and Debeski[3] reported an authentic case harboring both ovary and testicle. Early in 1936 Warthen and Williams[4] presented a case with bilateral ovotestis. There have been other reports in the literature entitled true hermaphroditism, but they failed to satisfy the microscopic requirements. McFarland[5] demonstrated only testicular tissue in an individual who was otherwise a typical female. The tissue was removed at operation for femoral hernia and was later identified microscopically as testis. Urechia and Teposu[6] showed microscopic sections of uterus and ovary removed at operation from an individual with hypospadias and gynecomastia. They obtained living spermatozoa from their patient and concluded, although in the absence of proved testicular tissue, that their patient was a true hermaphrodite. Morison[7] presented a case as true hermaphroditism in which only testicular tissue was demonstrated. Warthen and Williams[4] cite a case by Essenberg and Feinberg, but we cannot locate the reference in the literature. Including the case reported here, the instances of true hermaphroditism in man up to the present time, number fifteen.

*The endocrinologic studies were made possible by a grant from the Buhl Foundation.

CASE REPORT

Patient (No. 25957), twenty-nine years old, white, was admitted to The Elizabeth Steel Magee Hospital as a female, complaining of an enlarged clitoris which became erect at times, and caused considerable annoyance. Generally "her" health has been good and "she" has been considered a female all her life. The clitoris became enlarged at fourteen. Menses began at fourteen and have been regular each month, lasting for five days, associated with pain and accompanied by soreness and irritation of the clitoris. During school years "she" was rather athletic, and recently "she" has worked as a saleslady. The past medical history and the family history were of no interest.

Physical examination showed a patient 54 inches high, weighing 117 pounds. The general body contour suggested a male figure with relatively broad shoulders and narrow hips (Fig. 2). There was a small amount of fine hair on the upper lip. The breasts were small, with large nipples. The pubic hair was of feminine

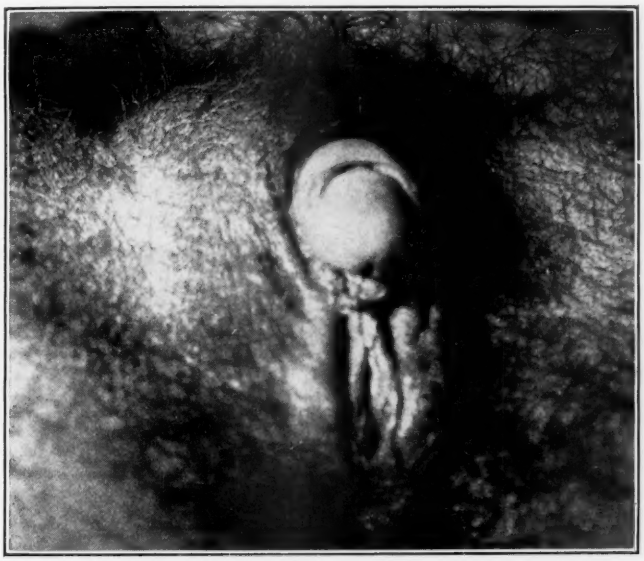

Fig. 1.—External genitalia before operation, showing penis and vulva. Note urethral indentation in glans, and swelling in right groin.

distribution. There was a mass that was freely movable and the size of a normal ovary in the right inguinal canal, 2½ cm. from the external ring. The introitus was small and protected by an intact hymen. The phallus measured 6 cm. in length and 2 cm. in diameter. There was a fold of skin, a prepuce, covering the glans (Fig. 1). The urethra was located at the site seen in the normal female. The vaginal vault was smaller and more shallow than normal. The cervix was small, nulliparous in type, and was continuous with the uterus which, while displaced to the right, was of normal size. X-ray examination following lipiodol injection revealed the uterine cavity of normal size and contour. The left tube filled with lipiodol and appeared normal. There was no shadow for the right tube. Routine laboratory examinations gave results within normal limits.

At operation, the phallus was amputated close to the base. The mass in the right inguinal region was reduced into the abdominal cavity and the abdomen opened. The uterus was of normal size, although drawn to the right. The left tube appeared

normal and the left gonad was examined grossly and was considered as a normal ovary. The contents of the right inguinal canal were, right tube, anomalously inserted round ligament, and gonad. The gonad was the size of a normal ovary, but had a dark flattened lower pole. Its upper pole was studded with small red protrusions. The right gonad was removed but the right tube, which was considered normal, was left intact. No other structures were removed. The hernial sac was repaired and the abdominal wound was closed. The patient made an uneventful recovery, and five months after operation considered herself a normal female.

Tissue Examination.—The phallus measured 6 cm. in length and 2 cm. in diameter. It resembled a penis with prepuce, glans, and body. There was an

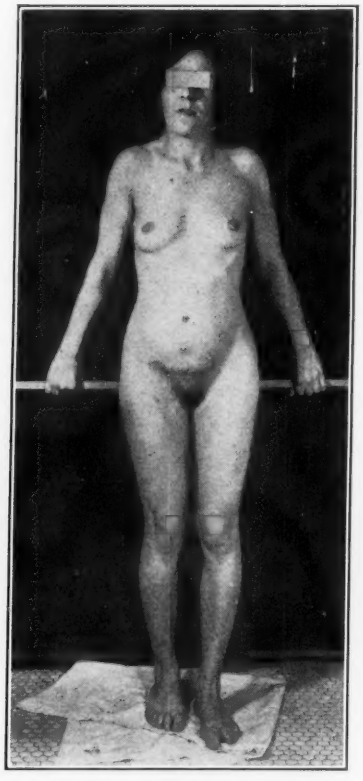

Fig. 2.—Patient after operation.

urethral indentation on the lower aspect of the glans, but no opening was present (Fig. 1). On cross-section two well-defined corpora cavernosa were present surrounded by a dense connective tissue. No corpus spongiosum was seen. Microscopic examination showed typical corpora cavernosa surrounded by a heavy tunica albuginea.

The ovotestis measured 3½ by 2½ by 1 cm. Its upper pole was somewhat broader than its lower pole and the surface was yellow white studded with small red protrusions. The surface of the lower pole had a red cast, and there was a fairly sharp line of demarkation between the two. There was a definite hilar indentation. On gross section the upper pole occupied a little more than half of the entire structure and presented an appearance typical of ovary with small cysts containing

watery or pink fluid and bodies resembling corpora fibrosa. The lower pole had a yellow brown striated appearance and threadlike tubules could be pulled from the surface, as from normal testis. Microscopic examination showed the upper pole typically ovary, with primordial follicles, graafian follicles in all stages of develop-

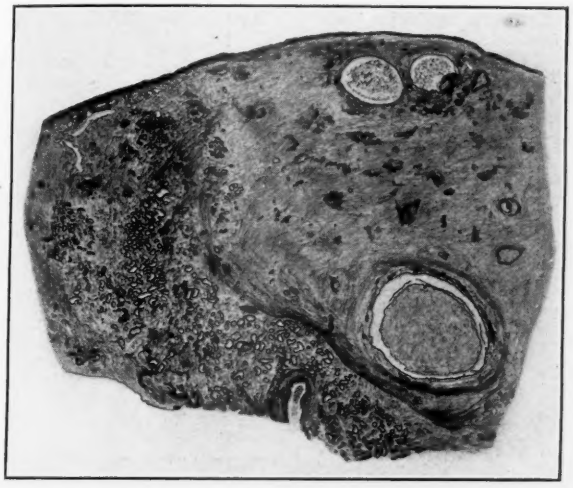

Fig. 3.—Ovotestis. ×10.

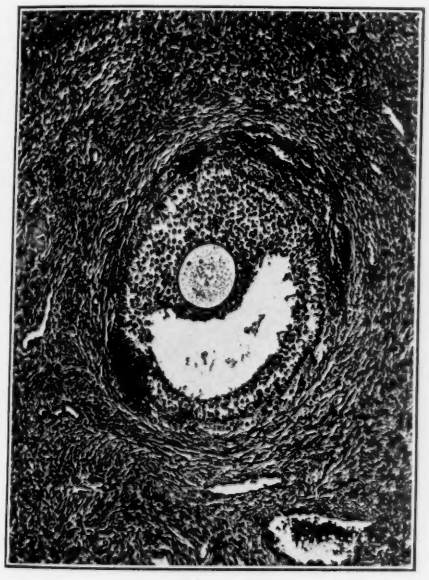

Fig. 4.

Fig. 5.

Fig. 4.—Maturing graafian follicle. ×100.

Fig. 5.—Testicular tubules partially atrophic. Note loose stroma and interstitial cells. ×100.

ment, corpora hyalinosa, and small cysts surrounded by hemorrhage. The stroma was characteristic of ovary (Figs. 3 and 4). The lower pole was composed of seminiferous tubules in varying stages of atrophy. Some of the tubules contained

cells several layers thick, others only a single layer of cells with a thick hyaline tubular wall. Other tubules were completely hyalinized. There were numbers of cell nests which were interpreted as interstitial cells (Fig. 5). Toward the hilar portion there were tubules lined with deep staining epithelium suggestive of rete testis.

ENDOCRINE STUDIES

Estrin determinations were made on the urine according to the method of Cuyler,[8] with the following results:

3 days prior to operation	3.5 rat units
15 days after operation	9.0 rat units
16 days after operation	11.0 rat units
67 days after operation	16.6 rat units
5 months after operation	5.2 rat units

Androitin determinations were made on the urine according to the method of Cuyler and McCullagh,[9] with the following results:

3 days prior to operation	5.5 mm. of growth
1 day after operation	5.5 mm. of growth
15 days after operation	2.0 mm. of growth
67 days after operation	0.0 mm. of growth
5 months after operation	0.0 mm. of growth

Blood iodine determinations were made following McCullagh's[10] technic to ascertain any variation in thyroid activity.

3 days prior to operation	8.4 micrograms in 100 c.c. blood
13 days after operation	5.9 micrograms in 100 c.c. blood
14 days after operation	51.0 micrograms in 100 c.c. blood
15 days after operation	30.4 micrograms in 100 c.c. blood
67 days after operation	9.2 micrograms in 100 c.c. blood
5 months after operation	8.6 micrograms in 100 c.c. blood

The abnormal iodine readings found subsequent to operation are the result, probably, of the external application of iodine to the patient's skin in dressing the operative wound.

COMMENT

Theoretical considerations of hermaphroditism with attempts to explain the formation of such anomalies are considered in Kwartin and Hyams'[1] paper where they review the literature on the subject. There have been numbers of detailed descriptions of the external appearances and of the detailed anatomy of hermaphrodites. In certain reports[2] the sex life of such individuals has been considered, where an individual lived part of the time as a man and part of the time as a woman, marrying an individual of the opposite sex and apparently enjoying a successful marital state in each instance. It is highly possible that such a condition might exist if it be considered that both hormones may be present at the same time. In our case, the female characteristics outshadowed the male and this can easily be explained by the amount of hormone present. Further, the fact that the androitin secretion diminished to zero following removal of the right ovotestis suggests that the left gonad which was not removed at operation is an ovary. It is also interesting that the ovarian tissue microscopically is much more the normal than the testicular tissue which shows atrophic changes. The individual then was more female than male. This is the first report in which both male and female sex hormones have been simultaneously demonstrated in hermaphroditism. Finkler[11] made endocrine studies on a pseudohermaphrodite female and demonstrated only traces of estrogenic substances until after treatment when the menses appeared and the estrogenic substance was increased in amount.

SUMMARY

1. A case of true unilateral hermaphroditism in an adult white person is reported.

2. The phallus and ovotestis were removed at operation, leaving probably normal female internal and external genitalia.

3. Endocrinologic study is presented for the first time in true hermaphroditism with the demonstration of both male and female sex hormones. The male sex hormone disappeared entirely while the female sex hormone increased in amount after operation.

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Moyes, R. E.: The Problem of the Midwifery Services From the Standpoint of the Country Practitioner, Brit. M. J. 2: 386, 1936.

The author describes the home conditions for maternity service that exist in a semiindustrial area in Newcastle-on-Tyne and in North Northumberland. The author is of the opinion that a great deal of harm is being done and undue alarm created among women by the publicity given to maternal mortality in the press. Any improvements in the maternity services of the country generally should be along the following lines: (1) A medical man and a midwife should attend each case. (2) Routine antenatal care for each case. (3) Where necessary, aseptic equipment should be provided, to include blankets, bedpans, dressings, etc. (4) No midwife or district nurse should be allowed on duty with other cases that are suspect or septic. (5) Where necessary, anesthetics should be provided at the expense of the local authority. (6) An emergency service should be established in each area and also a scheme of expert service available for all conditions at all stages.

F. L. Adair and S. A. Pearl.

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The blood supply of the ovary essentially depends upon the anatomic arcade formed by the two arterial trunks coming from the uterine and the utero-ovarian arteries respectively. Either one of these arteries can supply the ovary with all the blood it requires. Hence ligation of only one of these vessels does not interfere with the nutrition of the ovary. Therefore, the author sees no justification for the complicated operations devised to save the branch from the uterine artery in order to ensure a proper blood supply for the ovary. A salpingectomy may safely be performed without interrupting the blood supply to the ovary. However, the author prefers ligation of the individual blood vessels in the mesosalpinx rather than a mass ligature.

J. P. Greenhill.

THREE CASES OF PLACENTA PREVIA FOLLOWING TUBAL INFLATION

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DURING the past five years of my private practice, I have seen 120 patients in whom a complete investigation of their infertile marriage was made. One hundred and two patients complained of primary sterility and the remainder of the secondary type. Ninety-eight had some degree of tubal patency, whether normal or partial, judging from their symptoms, fluoroscopy in certain cases, and the kymographic tracings of the tubal peristalsis. Eleven became pregnant the month of inflation or the following month. According to the criteria of Rubin and others, these pregnancies can be attributed to the inflation. Ten of these patients had intrauterine pregnancies and one developed a tubal pregnancy. Of the ten women with intrauterine pregnancies, three developed placenta previa. This occurrence becomes even more unique when it is noted that but one other case of placenta previa has been seen in my private practice.

All three patients with placenta previa were multigravida, this being the fourth pregnancy for one, the third for another, and the second for the last patient. Each had had one abortion. Curettage had been necessary in only one case. All were spontaneous in origin. No placenta previa occurred in any of the seven patients who had never before been pregnant and who became gravid immediately after inflation.

The etiology of placenta previa is conjectural. Arey[1] states that the determining factors which cause nidation of the ovum and placentation in any particular area in a strictly physiologic pregnancy are unknown. Cilia and muscular action have been held responsible for the transportation of the ovum to its implantation site. There is no reason to believe that the point of entry bears any necessary relation either to the mouths of the uterine glands, which are too small to offer lodging, or to mucosal folds or furrows. In fact, the premenstrual endometrium is swollen and smooth at the time of implantation, whereas foldings are first characteristic of the young gravid state. In man it is impossible to know whether chance or special qualities of the mucosa govern the selection of the site. Conceivably the more pronounced premenstrual changes occurring in the fundus, and especially in the median planes, are significant in view of the predilection for these locations. Perhaps the spot may be lacking in cilia so that the embryo becomes stranded.

Bethel Solomons in 1929 before the British Medical Association said that "a pathological condition of the endometrium is a fruitful cause of placenta previa.

Curettage should be done before the next pregnancy.'' He stated that there had never been a repeat case in his practice since that procedure had been established.

Solomons and H. E. Canter[2] believe that placenta previa is caused by a deficient formation of decidua in the upper portion of the uterus with a normal decidual formation in the lower portion. They feel that the deficiency of stroma cells following infection, too frequent labor, etc., and their replacement by fibrous tissue is the reason for the deficient decidual reaction in the fundus. Changes in the endometrium as to diminution of stroma cells occur more readily in the upper portion than the lower with the result that there should be a normal decidual reaction in the lower part of the uterus. From their experimental work they conclude that the deficient decidual reaction in the upper part of the uterus is the cause of placenta previa.

Holmes[3] summarizes the etiologic factors of placenta previa as follows: (1) an antecedent endometritis, postpartum or postabortal, or the result of contamination by intrauterine manipulations or other infections, or some pathologic alterations of the mucosa resulting from degenerative changes incident to neoplasm or endocrine disturbances; (2) direct result of the effect of abnormal migrations of the ovum (gravity), overgrowth of the placenta or a reflexal placenta.

No attempt to conclude that tubal inflation was an etiologic factor in the causation of placenta previa can be made here. Two of these patients had normal patency and the other had uterotubal spasm. Each of these patients was a multigravida and one also had fibroids of the uterus. This patient had menorrhagia, but it is doubtful if there were any submucous fibroids as the menorrhagia was controlled by the use of desiccated thyroid. There no doubt had been some antecedent endometrial alteration in all cases. However, it is believed safe to assume that the insertion of the cannula could cause a release of a thickened mucous plug in the region of the internal os and the lower portion of the body of the uterus with the result that the endometrium in this area offered a better nidatory bed for the impregnated ovum than the endometrium in the upper portion of the uterus.

CASE REPORTS

CASE 1.—Hospital No. 76265. Mrs. B. M., aged thirty, complained of secondary sterility. There had been three pregnancies; the first two, forceps deliveries at term, and the third ending in a six weeks' spontaneous abortion. There had been involuntary sterility for the past four years.

The physical examination was essentially negative, as was the pelvic examination. A Hühner test was normal. Tubal inflation was done on Aug. 13, 1934, five days after the cessation of the period. A graph typical of uterotubal spasm was obtained. The patient had shoulder pains immediately upon sitting up. She was seen on Oct. 28, 1934, with a history that her last menstrual period had occurred on Sept. 10, 1934. Friedman test was positive. Pregnancy was marked by a slightly greater weight increase than normal. Her basal metabolic rate was -8½, and she was given small doses of desiccated thyroid. Quickening was noted on January 20. Date of expected labor was about June 17, 1935. On May the second, the patient spotted slightly and she was put to bed. The spotting recurred again one week and ten days later despite bed rest. She was then hospitalized. The following day she lost about 200 c.c. of bright red blood without any pain. Vaginal examination revealed the cervix to be long and to admit one finger. The placenta was found covering about two-thirds of the internal os. The patient was about thirty-five weeks pregnant. A low classical cesarean section was done and a four-pound, fifteen-ounce male infant was delivered. Both mother and infant left the hospital in good condition.

CASE 2.—Hospital No. 76623. Mrs. L. L., aged twenty-four, was seen on Feb. 4, 1935, complaining of relative sterility. Four years previously she had had a spontaneous abortion at two months.

Physical examination was relatively negative, except for a moderate girdle obesity. Pelvic examination was essentially negative. Basal metabolic rate was -2. Study of the husband's spermatozoa revealed that the percentage of abnormal forms was well within the normal range. A reduction diet and small doses of thyroid were given. The patient was next seen on June 5, 1935. She had lost thirteen pounds in weight. Tubal inflation was done and the tubes were normally patent. The patient became gravid during that month, and when seen on Aug. 10, 1935, the uterus was the size of a seven to eight weeks' gravidity. Quickening occurred on Oct. 10, 1935.

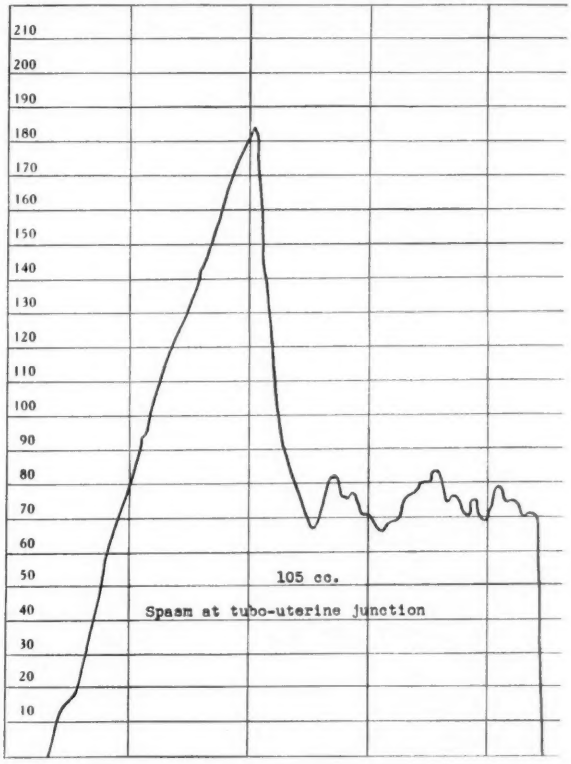

Fig. 1.—Kymographic tracings of tubes of patients who had placenta previa. Spasm at tubouterine junction.

The date of expected labor was about March 6, 1936. On Dec. 9, 1935, when the patient was about twenty-seven to twenty-eight weeks pregnant, she began to spot slightly with no pain. This continued very slightly until December 12 when there was a sudden passage of bright red blood. Total amount lost at this time was about 150 to 200 c.c. She was transferred to the hospital and examination revealed the cervix to be dilated 3 to 4 cm., and the placenta was found covering part of the internal os. The membranes were ruptured artificially and a Voorhees' bag was inserted. Four hours later there was complete dilatation of the cervix, and an infant weighing 1¾ pounds was delivered by version and extraction. The infant died twelve hours after birth. Convalescence of the mother was uneventful.

CASE 3.—Hospital No. 76265. Mrs. L. M., aged thirty-seven, was seen July 23, 1934, complaining of menorrhagia of one year's duration and secondary sterility.

The patient had been married for sixteen years and had one full-term delivery fourteen years previously. In 1926 she had had a cervical repair and appendectomy performed. Four years previously she had had a dilatation and curettage for incomplete abortion. A hysterectomy had been recommended because of the menorrhagia and small fibroids.

Physical examination was negative, except for the fact that the patient was moderately overweight and had a mild myxedematous appearance. Pelvic examination revealed the uterus to be slightly larger than normal and slightly irregular on the right side, as though there were several small subserous fibroids. The cervix was clean and normal in appearance. Basal metabolic rate was -12.9 per cent. The Hühner test was normal. She was given small doses of thyroid extract for her hypothyroidism, and iron therapy for her mild secondary anemia. After eight weeks of therapy the patient's general well-being was considerably improved, and her menstrual periods had approached the normal both in duration and in the amount of blood lost. Because of no pregnancy after five months of therapy, a tubal inflation was done on Jan. 11, 1935. The tubes were normally patent. The patient became pregnant immediately. Quickening was felt on May 8. The date of expected labor was Oct. 9, 1935. On Sept. 2, 1935, the patient had slight painless bleeding, bright red in color. She was transferred to the hospital. The bleeding was intermittent on

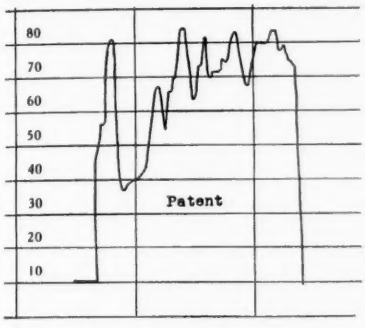

Fig. 2.—Normal patency.

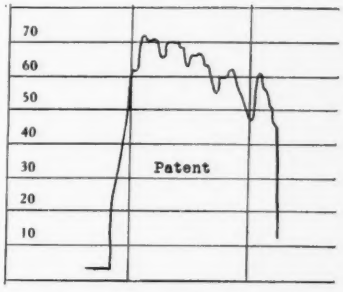

Fig. 3.—Normal patency.

Sept. 3, 1935. There was no bleeding until September 6, when the patient had a painless hemorrhage of about four ounces of bright red blood. Vaginal examination was done and the cervix was found to admit one finger with the placenta covering the entire internal os. The patient was approximately thirty-five weeks pregnant. A cesarean section was performed and the placenta was seen to be completely covering the internal os. A male five-pound six-ounce infant was delivered. The condition of both mother and infant was good. The patient has been examined at frequent intervals and one small subserous fibroid is noted on the right side of the uterus. Menstruation has remained within the normal limits under small doses of thyroid.

SUMMARY

Three cases of placenta previa in women who became pregnant immediately following inflation are reported. All three patients were multigravida with long periods of sterility since their last pregnancies.

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MENSTRUAL FISTULA (TUBO-ABDOMINAL)

With the Report of a Case

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THE occurrence of a menstrual, tubo-abdominal fistula is sufficiently uncommon to merit the addition of such a case to the literature.

Menstrual fistula is a term proposed by Ballin* for a fistula in a laparotomy scar characterized by the periodic discharge of blood, more or less coincident with normal menstruation. He describes two types; namely, those due to direct communication with the uterine or tubal lumen, and those due to postoperative enclosures of endometrial tissue in the abdominal wall. The utero- or tubo-abdominal fistula usually follows an operation for pelvic inflammatory disease, in which partial or complete salpingectomy or partial hysterectomy has been performed. Occasionally it occurs after certain types of operation for ventral fixation of the uterus, especially where nonabsorbable suture material has been utilized. The second type may also follow operations on the uterus and adnexa, during which endometrium may be deposited in the abdominal wall, as in cesarean section.

Although most of these fistulas originate after a surgical operation, there have been reported rare instances of a pyosalpinx or a tubal pregnancy which have ruptured spontaneously through the abdominal wall and resulted in the formation of a fistula. On the other hand, endometriomas arising from displaced müllerian derivatives have also been reported as occurring in the abdominal wall and giving rise to periodic discharge of blood.

CASE REPORT

An eighteen-year-old unmarried woman was admitted to the Beth Israel Hospital on Feb. 19, 1936. She complained of bleeding from an abdominal scar at each menstrual period since July, 1935. Previous to this her menses were normal. She had had an appendectomy in 1934. In May, 1935, the patient, then living in Georgia, noted a yellow vaginal discharge before and after her periods. This was associated with burning on micturition. Her June period was prolonged for thirteen days and was accompanied by severe lower abdominal pain and right costal pain which radiated to the right shoulder. A dilatation and curettage was performed on July 7, at Rome, Georgia on the diagnosis of an incomplete abortion. She was discharged from the hospital after a stay of three days but returned the following day with a temperature of 103° F. A laparotomy was immediately done and both tubes and the left ovary were removed. There was no drainage of the wound. She was allowed to leave the hospital after eight days.

On the second day of her next menstrual period she observed a bluish swelling at the lower end of the abdominal scar. The swelling increased in size, became pain-

*Ballin, M.: Surg. Gynec. Obst. 46: 525, 1928.

ful, and ruptured spontaneously in three days, discharging bloody fluid. The wound healed over in a few days. For the five months previous to her admission to the hospital, the bloody discharge appeared with each menstruation.

On admission there was an induration one inch in diameter at the lower end of the midline abdominal scar. In the center of this area was a pinpoint opening discharging sanguineous fluid. The uterus was found to be fixed anteriorly. No other masses were palpated. The smear of mucopurulent discharge from the cervix revealed the presence of gonococci. No gonococci were found in the urethral discharge. The complement fixation test for gonorrhea was weakly positive. The Wassermann and Kahn tests were negative. Red blood count was 3,500,000, hemoglobin 70 per cent. The sedimentation rate was normal.

Fig. 1.—Roentgenogram. Lipiodol shadow in uterus, stump of right tube and fistulous tract from stump of left tube to the abdominal wall.

Further diagnostic and therapeutic procedures had to be postponed because of the active gonorrhea. The patient received hyperpyrexia treatment as developed by Bierman and Horowitz for the cure of her gonorrhea. On the day following the treatment and on three subsequent occasions the smears were negative for gonococci. The cervical discharge disappeared.

In order to determine more clearly the true condition, lipiodol was injected through the cervix into the uterine cavity. There was no escape of oil through the sinus opening. The x-ray, however, showed the right tube closed about 1 cm. from the isthmial end and a sinus tract leading from the left tube to the abdominal wall (Fig. 1). The diagnosis was therefore made of tubo-abdominal fistula.

On March 13, I. C. Rubin excised the tract under spinal anesthesia. The operative procedure and findings were as follows: the scar containing the indurated portion

and the fistulous opening was excised down to the fascia. In the subcutaneous tissue, the fistulous tract could not be identified, but when the fascia was exposed, the opening was observed and a probe was inserted for a distance of two inches. The peritoneal cavity was opened. After separation of many dense adhesions between uterus and omentum, the relationship between the fistula and the uterus was established. The right tube and most of the left tube and ovary had been removed at the previous laparotomy. The right ovary was cystic and enlarged to the size of a peach. The uterus was dextroverted, and the fistulous tract was found to go to the stump of the left tube which was situated to the right of the median line. The fistulous tract, the stump of the left tube, and the interstitial portion were removed by a cylindrical excision of the uterine wall down to the level of the endometrium. The opening in the uterus was closed by two layers of buried sutures of chromic catgut. A Lembert suture was used for the serosa. The left round ligament was used to cover over the sutured area by sewing it to the anterior wall of the uterus.

Fig. 2.—Microphotograph (high power) showing the tissue spaces lined by foreign body giant cells simulating epithelial tract.

The patient made an uneventful recovery. The operative wound healed by primary union, and when the patient was last seen eleven months after the operation, her menses were somewhat irregular but there was no recurrence of bleeding from the abdominal scar.

PATHOLOGIC REPORT (DOCTOR A. PLAUT)

A. A strip of skin 14 cm. long and 1 cm. wide. Microscopic section showed chronic inflammation of the subcutaneous tissue. There were present giant cells and pigment. Some giant cells contained highly refractive, partly crystalline, small foreign bodies.

B. Another piece of the specimen was irregularly conical, measuring 4 by 3.5 cm. at the base and 5 cm. in height. The base was formed by muscle tissue and dense fascialike tissue. The uppermost portion was irregularly conical; this portion was

2 cm. high and measured about 2 cm. at the base. A round pedicle about 8 mm. in diameter connected this portion with the aforementioned one. A fistula opened at the tip; it could be probed deep into the specimen. On microscopic examination the opening at the conical end corresponded to the interstitial portion of the tube. The mucosa was slightly inflamed but otherwise nothing unusual was seen. There were no glandular structures in the muscle tissue surrounding the interstitial portion of the tube. The myometrium was not inflamed. The large section of the muscle and fascial portion of the specimen showed very little change in the muscle tissue. Many tissue spaces in the fascia were distended and were lined with large cells, mostly of the character of foreign body giant cells. In some of the tissue spaces this lining was so regular that it simulated epithelium (Fig. 2). There were no epithelial structures. In the surroundings of this foreign body reaction, recent hemorrhage was found and much old blood pigment. There was much diffuse inflammation and some evidence of regeneration. A similar picture was seen in the smaller piece of tissue which consisted of muscle tissue and fat tissue with many lymphoid foci.

Diagnosis: Blood pigment and foreign body inflammation leading from interstitial portion of tube to the cutis of the abdomen.

The points of interest in this case may be briefly summarized:

1. The fistula developed soon after a laparotomy where no drainage was instituted and no unabsorbable suture material used. Infection may be presumed to have been present. The production of the sinus tract probably followed the resolution of a hematoma or exudate around the stump of the left tube which became adherent to the lower angle of the incision, eventually breaking through the line of least resistance and leaving in its wake an irregular fistulous tract.

2. It was possible to demonstrate the tubo-abdominal fistula by means of a radiopaque substance which identified the tube involved, thus facilitating the operative procedure.

3. Though the fistulous tract could be probed, the pathologic examination failed to reveal any definite epithelialized tract. The microscopic section showed tissue spaces lined by foreign body giant cells, simulating epithelial-lined tracts. These spaces evidently provided the avenue of escape for the blood from the uterine cavity to the abdominal surface.

I want to thank Dr. Rubin for the privilege of reporting this case.

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THE USES AND LIMITATIONS OF ROENTGEN PELVIMETRY

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WITHIN the last fifteen years obstetrics has seen the development of a number of roentgen methods for measuring the bony pelvis. The advantages in obstetric practice of possessing information regarding the dimensions of the pelvis are obvious, and it is also true that such information must leave no doubt as to its accuracy. The chief methods in vogue today are accurate to the degree necessary for all obstetric purposes, and certain stereoscopic methods, although requiring a good deal of special technic and apparatus, not only appear reliable but are quite striking in their portrayal of the pelvis.

With the experience gained from the use of these newer methods of pelvimetry, it is apparent that we are in a process of transition from the general use of certain old-time methods to the adoption of newer and more accurate ones. These later methods have not only given us new concepts with regard to what we formerly considered the normal female pelvis but also a newer knowledge of the adaptation of the fetus to the birth canal in the process of birth. However, in any discussion of the usefulness of these methods we must not forget that the scientific conduct of labor involves so many factors that even possessing such exact dimensional knowledge, we should not form a concept of the process of birth which is entirely mechanical.

Let us consider for a moment some of these factors. The birth canal is composed not only of the bony structures but of soft parts, and the fetus also is composed in the same way. Mensuration of these bony structures therefore is not an entirely complete survey of the birth passage and its passenger. The forces which are concerned in labor are subject to influences which render them both voluntary and involuntary, and it would appear that much of this influence is hormonal in character. In addition, the influence of such factors as race, constitution, disease, emotion, and pain all share in the complex process. The usefulness of the knowledge of the dimensions of bony structures of the pelvis and fetus, therefore, has certain limitations, and to draw definite conclusions as to the outcome of labor without considering the whole picture is not only hazardous but unscientific. In other words, the greatly useful knowledge which these roentgen methods has given us must be properly assimilated with our greatest therapeutic weapon, namely, clinical experience. It is not enough to visualize the pelvis and fetus in space by means of roentgenograms. Indeed it is easy for the

inexperienced and enthusiastic to be sidetracked into false security if too much emphasis is given to roentgen information so obtained.

Roentgen methods are of great value, but they must be properly interpreted. At the present time, I have reached certain conclusions as to what should constitute an accurate and useful survey of the pelvis for practical obstetric purposes, and these are:

First: A roentgenogram showing the outline of the superior strait which may admit of reduction to its actual size and thus, drawn on centimeter paper, incorporated with the prenatal history. This procedure is entirely satisfactory in using the grid method plus the centimeter glass screen for reduction, the details of which I have set down elsewhere.[1]

Second: A lateral pelvic roentgenogram which may also be plotted in the same manner as above if desired. This should depict all of the anteroposterior diameters from the superior to the inferior strait, the contour and position of the sacrum, and the character of the sacrosciatic notch. Lateral roentgenograms at term or early in labor have an added advantage in showing the size and station of the fetal head and the relationship of this body to the birth canal.

Third: By internal pelvimetry determining the bispinous diameter using the method described by Hansen,[2] and by external pelvimetry of the outlet determining the anterior sagittal, posterior sagittal and intertuberal diameters.

The above roentgen information may be obtained, using but two 10 by 12 inch films, thus reducing the cost to a practical minimum. I have previously emphasized the advantages of the routine use of measures similar to the above, and in primiparous women I am convinced that they are of paramount importance. The older methods of estimating pelvic capacity are unreliable even in experienced hands, and the loss of a baby through an untimely operative procedure or of a mother through a delayed cesarean section may occur in these same hands as a result of inexact knowledge of the pelvic capacity.

The routine use of these measures is bound to have influence on future obstetric procedure through the important knowledge that we have already obtained regarding variations of the pelvis. The occurrence of wide variations in pelvic form in presumably normal individuals has changed our whole concept of the "normal female" pelvis. The value of greater statistical and clinical knowledge of these variations in relation to labor is obvious if we consider what a large experience will offer. These measures become then of great importance to the individual and to the development of our knowledge of the subject.

The value of the routine use of the above procedures has become much impressed upon me during the past two years, in which time we have

measured and delivered upward of 500 primiparous women. In conclusion, I would say that at the present time we have methods which are entirely adequate for measuring the pelvis as a routine procedure. Our next problem is to enrich our knowledge and experience by applying these methods to wide clinical use.

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VOLUMINOUS HERNIA OF THE CULDESAC OF DOUGLAS TREATED BY TOTAL COLPECTOMY

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During the last twenty-one years I have encountered thirty-eight large hernias of the culdesac of Douglas. The terms posterior vaginal hernia and enterocele have also been applied to this lesion. While a small amount of bulging of the culdesac is usually associated with all extensive rectoceles, the large definite hernias are not commonly met. In my experience the vaginal operation devised by George Gray Ward, which consists of a free dissection of the sac from all its attachments, transfixion and ligature of the base after reducing its contents, resection of the sac, approximation of the uterosacral ligaments in the median line and a high perineorrhaphy, is attended with very satisfactory results. For the hernias complicated by adhesions, I have resorted to the Moschcowitz operation, by obliterating the culdesac intraabdominally by means of superimposed layers of purse-string sutures. While this procedure was devised for prolapse of the rectum, it is equally efficient in the treatment of a culdesac hernia. My statistics show that twenty-eight patients were treated by the Ward technic and ten patients by the Moschcowitz procedure. Recently I have treated an enormous posterior vaginal hernia, the size of a fetal head, which could not be kept within the pelvis, even with the patient flat in bed. A small uterus was totally prolapsed and rested on the superior surface of the mass. Because of the large size of this hernia, I have employed total colpectomy or colpocleisis, with a gratifying result. The case of this patient forms the basis of the report which follows.

CASE REPORT

Mrs. C. McD., aged fifty-nine years, was admitted to the Gynecological and Obstetrical Service of the Carney Hospital on Aug. 26, 1936. She stated that five years ago she had first noticed a mass protruding through the vulva which she felt was "falling of the womb" and that the mass had become progressively more pronounced. There was nothing remarkable in her family and personal histories. The onset of menstruation occurred when she was sixteen years of age; the periods were of the twenty-eight-day type, lasted three days, and were painless. She had been married forty years, her husband having died of pneumonia, twenty years previously. She had had five children, all of whom were living and well, the oldest being thirty-eight and the youngest twenty-eight years of age. The first and third children were delivered instrumentally and the others normally. There were no abortions or miscarriages. She had occasional nocturia, getting up once at night, and she had always been obese.

The physical examination revealed the blood pressure to be 212 systolic and 110 diastolic. Except for obesity there was nothing remarkable about her development. The head and neck were normal except for the fact that she had poor teeth. The chest was large and symmetrical; the lungs were normal; the heart was large, the aortic second sound being very sharp, and there were extra systoles and compensatory pauses. The abdominal examination showed diastasis of the recti muscles, a small umbilical hernia, marked obesity of the abdominal walls, and a pendulous abdomen. A hallux valgus was present on each foot, otherwise the extremities were not remarkable. Examination of the genitals revealed a mass the size of a fetal head which was extruded through the vulva and severely ulcerated. It consisted of a voluminous hernia of the culdesac of Douglas, on which rested a small atrophied uterus, in complete prolapse (Fig. 1). This mass, which rested on the bed between the patient's legs, was reduced into the pelvis, but it was impossible to keep it there, as it again rolled out with the slightest intraabdominal pressure. A consultation was held with

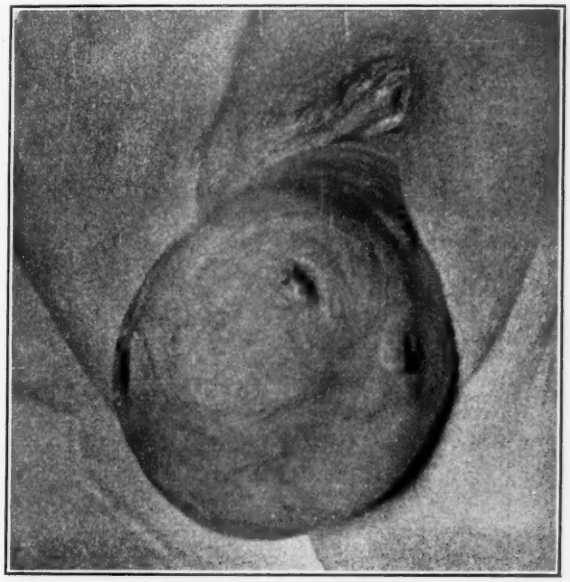

Fig. 1.—Hernia of the culdesac of Douglas, posterior vaginal hernia, accompanied by the total prolapse of an atrophied uterus. The dark spot in the center is the external os of the cervix.

the Medical Service of the Hospital, which advised slow digitalization because of her cardiac disorder and gave the preference to spinal anesthesia. The urine, which was acid, varied in specific gravity from 1002 to 1020, albumin varied from the slightest possible trace to a slight trace, and the sediment showed pus, free and clumped, and bacteria. The hemoglobin was 85 per cent, the red cell count 3,450,000, and the white cell count 8,900.

The patient was kept in bed from August 26 to September 8, during which time the ulcers on the prolapsed mass were painted with 4 per cent mercurochrome solution. On the last mentioned date the ulcers were completely healed and the blood pressure had dropped to 170 systolic and 90 diastolic. She was, therefore, prepared for operation, which was performed on Sept. 9, 1936.

Operation.—Spinal anesthesia was administered, using 200 mg. of novocaine crystals. The parts were scrubbed with green soap and water and painted with

Scott's solution. The uterine cavity measured two and one-half inches. A circular incision was made around the cervix and another around the prolapsed mass about 2.5 cm. below the urinary meatus. Vertical anterior and posterior incisions were made in the median line, uniting the two circular incisions. The vagina was then dissected off in two halves. The cervix was split in two, the anterior lip excised, then the posterior lip. The remaining cervical lips were approximated with five interrupted sutures of No. 2 chromic catgut, two on each side of the uterine cavity and one in the center over the canal, in which was tied a strip of Penrose tubing. The bladder and culdesac of Douglas were sutured to each other by means of interrupted sutures of No. 1 chromic catgut, gradually reducing the mass. Two purse-string sutures, one of No. 0 and one of No. 1 chromic catgut, superimposed, were placed in the perirectal fascia to reduce the rectocele. The edges of the vaginal incision were united with interrupted sutures of No. 2 chromic catgut, allowing the drain to come out through the central opening. The large mass was well reduced by this procedure.

Fig. 2.—Eighteen days after total colpectomy, colpocleisis, and perineorrhaphy. The photograph was taken while the patient strained.

The pelvic floor was opened below the mucocutaneous border. The levator ani muscles were freed on each side and a flap of posterior vaginal wall dissected upward. The levator ani muscles and their fascia were approximated with four interrupted sutures of No. 2 chromic catgut, the triangular ligament was united with four interrupted sutures of No. 0 chromic catgut, as were the superficial perineal tissues. The vagina and external perineum were closed with interrupted sutures of No. 1 chromic catgut. The primary result appeared to be excellent. A self-retaining catheter was introduced into the bladder, about 1,000 c.c. of clear urine being obtained. The spinal anesthesia had been satisfactory and the patient was returned to bed in good condition.

The patient made a good recovery from anesthesia, being kept comfortable with small doses of morphine. She passed considerable urine through an indwelling catheter. Her bowels were closed for seven days. On the second postoperative day her blood pressure dropped to 110 systolic and 55 diastolic, for which 2 gr. (0.120 gm.) of thyroid extract, three times a day, were prescribed. Urinary antiseptics in the form of methenamine, acid sodium phosphate and ammonium chloride were

given while the self-retaining catheter was in place, and the perineal sutures were painted daily with 4 per cent solution of mercurochrome. The catheter came out on the seventh postoperative day and was not replaced. The drain fell out on the ninth day. She was allowed to sit in a chair on the sixteenth postoperative day and was discharged from the hospital on the eighteenth day after operation.

At the time of discharge the perineum was healed and gave good support. The vagina was healed. There was no bulging on hard straining. The result was satisfactory (Fig. 2). The patient was discharged cured.

In my experience of 38 posterior vaginal hernias, this was the largest encountered, and it was felt that it could not be cured by ordinary means.

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Note: The illustrated technic of total colpectomy will be found in the Am. J. Obst. & Gynec. **30**: 548, 1935.

270 Commonwealth Avenue

PURPURA HEMORRHAGICA COMPLICATING THE PUERPERIUM*

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PURPURA, whether primary (essential) or secondary (either toxic or allergic) in nature, is a rare complication of pregnancy and the puerperium. In 1925 Rushmore[1] collected forty-seven instances from the literature, to which he added one case of his own. Several cases have been reported since then, bringing the total to about seventy. The mortality, as computed by deSaussure and Townsend,[2] is 55.7 per cent. Cases in which both mother and child are affected are unusual (seven in Rushmore's series), and recovery of both is exceptional.

Waltner,[3] in 1924, reported a case, not cited by Rushmore, of a woman of thirty-eight years, who had displayed symptoms of essential purpura hemorrhagica intermittently since the age of fifteen. One pregnancy had been uneventful. In the seventh month of her second pregnancy, purpura again appeared. The child was born with purpura. Both patients recovered.

Liebling[4] (1926) reported a case of purpura hemorrhagica, with recovery, in a mother and her newborn infant. The etiology was presumably a latent toxemia of pregnancy.

Rodecurt's[5] case of purpura in a newborn baby was attributed either to toxemia of the mother or to strangulation by the umbilical cord. The mother displayed thrombopenia but no purpura.

The cause of Siegler's[6] case of purpura hemorrhagica was latent toxemia of pregnancy. Although the mother recovered, the child died at the age of four days, probably from purpura hemorrhagica; autopsy was not permitted.

Peshkin and Miller[7] describe a case of allergic purpura hemorrhagica due to quinine and ergot taken as an abortifacient. Therapeutic abortion was performed, and recovery ensued.

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Rosenthal[8] reports a case of purpura appearing in a man after the ingestion of quinine. In an interval between attacks, the patient's idiosyncrasy to the drug was tested by the intradermal injection of a minute amount of quinine and urea hydrochloride. A profuse generalized purpura developed. The examination of the blood showed: "Hemoglobin, 90 per cent; red blood cells, 5,000,000; white blood cells, 16,000; platelets, 90,000; polymorphonuclear neutrophiles, 50 per cent; lymphocytes, 42 per cent; monocytes, 6 per cent; coagulation time, nine minutes; bleeding time, three minutes; tourniquet test, positive; clot retraction, none."

CASE REPORT

Mrs. E. L. (Bronx Hospital No. 53603, Clinic No. 33199), a twenty-eight-year-old white woman, was admitted to the Obstetric Service of the Bronx Hospital at 3:45 P.M. on March 8, 1935, because of indefinite pains the day before, slight staining, and postmaturity. The expected date of confinement was Feb. 25, 1935.

The patient's general condition on admission was good. The blood pressure was 134/86; temperature, 98° F.; pulse, 80; respiration, 20; heart rate, 90. There was a systolic blow at the apex. The presentation was vertex R.O.A.; height of fundus, 40 cm.; fetal heart, R.L.Q., 132; fetal head engaged; dilatation of cervix, one finger.

A soapsuds enema was given at 4:10 P.M.; and labor was induced medically by means of two ounces of castor oil and 20 gr. of quinine administered in divided doses of 5 gr. at fifteen-minute intervals between 5:00 and 6:00 P.M. By 9:00 P.M. the pains had become regular and strong, and the patient was removed to the delivery room. The membranes ruptured spontaneously at 9:25 P.M., and ten minutes later the patient was delivered of a living female child weighing 9 pounds, 11 ounces. No anesthetic was required. Following the expression of the placenta, a first degree laceration of the perineum was repaired, and 1 c.c. of pituitrin was administered. The patient was returned to the ward one hour later.

The patient had attended the Antepartum Clinic since Oct. 2, 1934. Her previous medical, surgical, and obstetric history was negative. Menstruation occurred irregularly every sixty to ninety days; the last period was May 18, 1934. Wassermann and Kahn tests were negative, and the pelvic measurements were normal. The prenatal course was unventful. The patient's first pregnancy had terminated in a normal child on Nov. 13, 1927.

At 11:45 P.M., March 8, 1935, two hours after delivery, the patient was found in severe circulatory collapse. Her blood pressure was 76/60; pulse, 100. She was very pale and was perspiring profusely. She had been bleeding moderately from the vagina since delivery. She was also bleeding from the gums, and there was a purpuric hemorrhage in the umbilical region. The vulva was edematous, and the vagina markedly ecchymosed. The patient now stated that six years prior to admission she had taken an emmenagogue, following which she had developed purpura and vaginal hemorrhage. Treatment had consisted of calcium and horse serum intramuscularly. Blood examination at that time had showed marked reduction of the platelets and prolonged bleeding time. After the patient's recovery, she had been given a teaspoonful of elixir of iron, quinine, and strychnine, following which purpura again developed; she was advised to take no more quinine.

A consultant then advised against retesting the patient for sensitivity to quinine, especially since her condition was poor, for his previous experience had shown the dangers of such a procedure. Morphine sulphate 0.25 gr., caffeine 7.5 gr., fluidextract of ergot 2 drams, and ernutin 1 c.c. were administered. The vagina was packed with iodoform gauze, through which the blood continued to ooze until March 12, when the packing was removed.

At 2:00 A.M., March 9, the patient received 600 c.c. of whole blood by the Soresi method; at 5:10 A.M., 500 c.c.; and at 3:30 P.M., 500 c.c. As hemorrhage from the vagina and gingival margins persisted, the patient was given another transfusion of 500 c.c. on March 10. The fifth and last transfusion, of 400 c.c., bringing the total to 2,500 c.c., was administered on March 13.

On March 11, numerous purpuric spots were observed on the left forearm. Marked ecchymosis was present at the site of transfusion. The mucous membranes were pale. Eye examination showed subconjunctival hemorrhage and pallor of discs.

TABLE I. BLOOD OF MOTHER

DATE	HB.	R.B.C.	W.B.C.	POLYS	BAND	LYMPH.	MONO.	PLATELETS	BL. TIME	COAG. TIME
3/ 9/35*	65%	3,600,000	35,300	76%	12%	4%	8%	17,000	45+ min.	2½ min.
3/10/35†	40%	2,650,000						21,000		
3/11/35	45%	1,680,000	19,800	86%		6%	7%	40,000	3 min.	5 min.
3/12/35	37%	1,800,000	14,000	74%	11%	12%	3%	128,000	2½ min.	4 min.
3/13/35‡	45%	2,670,000	15,200	76%	10%	7%	7%	120,000	3 min.	4 min.
3/15/35	52%	2,880,000	18,400	64%	7%	17%		144,000	2 min.	7 min.
3/16/35	49%	2,490,000	18,700	70%	6%	13%	11%	230,000	4 min.	3 min.
3/18/35	46%	2,520,000	10,400	73%	1%	24%	2%	184,000	2 min.	4 min.
3/19/35	50%	2,900,000	10,800	67%	2%	30%	1%	210,000	3 min.	4½ min.
3/20/35	58%	2,880,000	9,200	64%	4%	26%	6%	208,000	1 min.	2 min.
3/21/35	58%	3,240,000	11,400	73%	2%	17%	8%	216,000	1 min.	2½ min.
3/22/35	52%	3,420,000	9,700	60%		32%	6%	228,000	1 min.	2 min.
3/23/35	57%	3,410,000	11,500	61%	2%	33%	4%	230,000	2 min.	5 min.
3/25/35	58%	3,120,000	11,200	61%	3%	24%	12%	226,000	1 min.	2 min.
3/26/35	52%	3,800,000	9,000	71%	2%	22%	5%			
3/28/35	68%	3,790,000	7,900	54%		44%	2%	288,000	1 min.	3 min.
3/29/35	74%	3,800,000	6,100	73%	2%	23%	2%	230,000	2 min.	3 min.

*1600 c.c. whole blood administered by three transfusions.
†500 c.c. whole blood administered.
‡400 c.c. whole blood administered.

TABLE II. BLOOD OF BABY

DATE	HB.	R.B.C.	W.B.C.	POLYS	BAND	LYMPH.	MONO.	PLATELETS	BL. TIME	COAG. TIME
3/ 9/35	60%	2,980,000	24,500	39%	8%	48%	5%	10,000	25+ min.	1¾ min.
3/11/35	47%	3,280,000	14,000	54%	12%	17%	10%	24,000	5 min.	3 min.
3/12/35	64%	2,800,000	14,200	74%	5%	10%	2%	36,000	3 min.	4 min.
3/13/36	64%	4,230,000	10,000	57%	10%	26%	7%	55,000	3 min.	3 min.
3/14/35	65%	2,620,000	11,400	50%	4%	34%	2%	88,000	2 min.	4 min.
3/15/35	63%	3,760,000	10,900	50%	6%	34%	8%	96,000	2 min.	3 min.
3/18/35	78%	4,200,000	10,300	10%	6%	80%	4%		3 min.	3½ min.
3/25/35	65%	4,080,000	14,000	36%		53%	11%	220,000	1 min.	2 min.

The decrease of the purpuric spots began on March 17. Frequent examinations of the blood of both mother and baby were made, as shown in Tables I and II. Examination of the feces of both mother and baby revealed no occult blood; the benzidine tests of both were negative.

The mother's condition improved gradually. Iron and ammonium citrate and liver extract were administered daily. The temperature fluctuated between 99.8° F. and 103° F. until the twenty-first day of illness, when it returned to normal. The

pulse rate, which was 160 on March 9, the day after delivery, subsided gradually until it reached 72 on the day of discharge. The blood pressure ranged between 150/90 and 70/50. Mother and baby were discharged on March 29, in good condition.

The baby developed a generalized purpura shortly after birth. Purpuric and ecchymotic spots appeared on the abdomen, chest, both forearms, and thighs. Twenty c.c. of whole blood were administered intramuscularly the day after birth. A slight subconjunctival hemorrhage was noticed on March 11; the fundi were normal the following day, however. A quinine patch test, made March 15, was negative. The purpuric spots had practically disappeared at the time of discharge.

At postpartum examination on April 13, 1935, the condition of both patients was good, and purpura was no longer present.

During convalescence, the mother admitted having been confined in Rockland State Hospital for "nervous breakdown." Her record from that institution shows that she was admitted on Dec. 29, 1933, with dementia precox, catatonic type. She was discharged as improved on March 17, 1934. During the night of Feb. 14, 1934, the patient's nose began to bleed, and continued to bleed until the following day. There was also hemorrhage from the gums, and purpuric spots were present on the bridge of the nose, buccal mucous membranes, and inner surfaces of the thighs. The diagnosis was purpura hemorrhagica.

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1132 Park Avenue

Bacon, H. E.: The Specificity of the Frei Test in Lymphopathia Venera, Am. J. Digest. Dis. & Nutrition **2:** 570, 1936.

The author presents an extensive review of the literature and emphasizes the importance and specificity of the Frei test in lympathia venera or lymphogranuloma inguinale. He stresses the importance of proctologic examination. In a series of 155 cases 96.7 per cent gave a positive Frei test. Three of the remaining 5 patients showed a positive Wassermann reaction. During the institution of antisyphilitic therapy and even after the completion of the course, he repeatedly failed to obtain a positive Frei test. Bacon feels that apparently there exists a reciprocal immunologic reaction between syphilis and lymphopathia venera. He calls attention to other authors who noted that in the presence of a recent or an active syphilitic process the Frei test may be rendered temporarily inactive.

His observations over a period of two years on the Frei reactions in various stages of the disease indicate that in the presence of clinical evidence one negative test does not exclude presence of this disease.

J. P. Greenhill.

DIFFUSE SQUAMOUS CELL CARCINOMA OF THE UTERUS

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DIFFUSE squamous cell carcinoma involving the fundus of the uterus was first described by Ruge[1] in 1882. Since that time approximately 40 cases have been reported in the literature.[1] The condition probably occurs with much more frequency than is suspected, and its nonrecognition must be attributed to the fact that radiotherapy has become almost universally the method of treatment in carcinoma of the cervix. Since the acceptance of this form of treatment makes the opportunities for the study of such material as is here presented more and more limited, the following case is worthy of detailed recording.

REPORT OF CASE

A. M., aged sixty-five, never gravid, was admitted to the Lincoln Hospital on Sept. 22, 1934, complaining of vaginal bleeding of eighteen months' duration. She had menstruated regularly until her menopause at the age of forty. In October, 1933, she had been at the Morrisania Hospital where an epidermoid carcinoma of the cervix was found, for which she received 3,060 mg. hr. intrauterine radium, and 5,040 mg. hr. to the cervix. Following this she was free of bleeding until one month before admission to the Lincoln Hospital, at which time she was again bleeding profusely. Her general physical and laboratory examinations were essentially negative. Pelvic examination showed a shortened, contracted vagina which admitted only one finger to a depth of one inch. There were senile changes and desquamation of the vagina, so that the cervix could not be felt.

All parametria were obliterated. On rectal examination a short cervix, and a retroverted soft uterus enlarged to the size of a two months' gravidity could be palpated. Because of the enlarged soft uterus, and because the patient had received radiotherapy to the cervix, it was felt that the body of the uterus rather than the cervix was the cause of the bleeding, and a hysterectomy was decided upon. A supravaginal hysterectomy with bilateral salpingo-oophorectomy was performed under general anesthesia with comparatively little difficulty, care, however, being exercised to wall off the uterine cavity at the site of amputation by means of large clamps in order to prevent soiling of the peritoneum by any material present in the uterus.

PATHOLOGIC REPORT

Gross.—The specimen consisted of a symmetrical uterus which had been supravaginally amputated, enlarged to the size of a two-and-one-half-month gravidity. Its external surface was smooth, peritoneal surface intact, and consistency cystic. On section, the uterine cavity was distended due to the presence of about 3 ounces of seropurulent exudate. The endometrium in its entire extent was replaced by a friable papillary tissue having a thickness of 0.5 cm. Its color was grayish white

and its consistency soft and crumbly. The myometrium had partially been replaced by this tumor tissue, but a distinct line of demarcation could still be made out. Normal endometrium could not be recognized throughout the entire mucous membrane, the tumor extending continuously to the point of amputation.

Microscopic.—Histologically, the endometrium was seen to be replaced by a tissue composed of squamous cells arranged in the form of compact papillary cords tending to form rounded or clubbed ends. This tissue extended down to the myometrium where a distinct line of demarcation could be distinguished. The squamous cells composing the tumor tissue were immature, in the main being in a transitional stage.

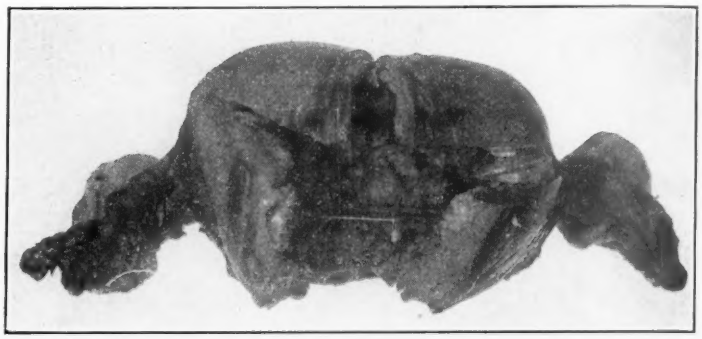

Fig. 1.—Gross specimen. The entire endometrium is replaced by a papillary tissue which measures 0.5 cm. in diameter.

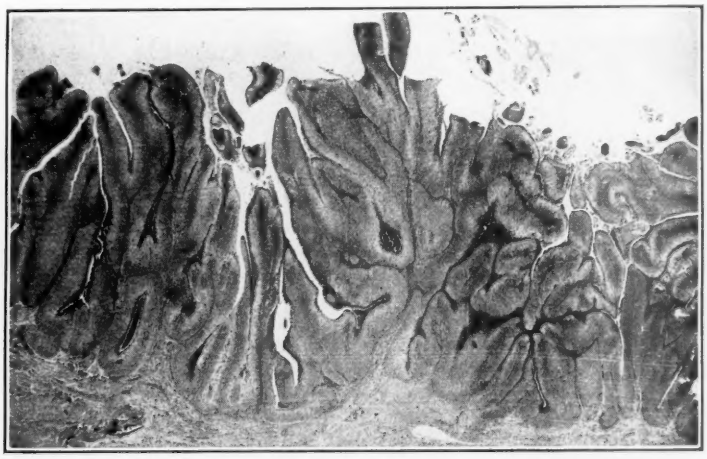

Fig. 2.—Very low power. The papillary structures in the form of dense compact masses are distinguishable. In the lower left corner slight infiltration of the myometrium can be seen.

In areas, beginning keratohyalinization could be seen, and here occasional mature cells showing mitotic figures were discernible. Arrangement in the form of "pavement" stratification was also present. Numerous sections taken through different areas of the uterine wall failed to show even the slightest evidence of normal endometrium.

Following the operation the patient's recovery was uneventful, and after three weeks she was transferred back to the Morrisania Hospital for the purpose of receiving more radiotherapy. She has been there ever since, and has received 8,000

R.U. to the pelvis, as well as about 1,500 mg. hr. of radium to the vagina and rectovaginal septum. Recent examination shows ulceration and infiltration of the vagina and the rectovaginal septum. There is no parametrial involvement, nor are any adnexal masses palpable. Biopsy taken on May 15, 1935, from the vaginal infiltration shows an acute inflammatory exudate, single groups of squamous hyperchromatic cells, and giant cells.

Fig. 3.—Low power. The nature of the papillations is shown. They are composed chiefly of transitional squamous cells, immature in type.

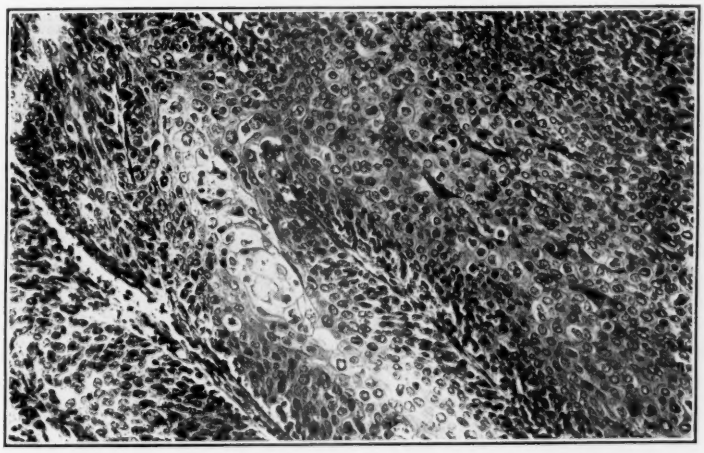

Fig. 4.—Higher power. The transitional cells are distinguishable and there is a tendency toward the formation of the adult type of epithelium. The arrangement is of the "pavement" type. There is also evidence in the center of keratohyalinization.

DISCUSSION

Squamous cell carcinoma of the body of the uterus has given rise to considerable discussion. Lahm[2, 3] has collected 20 cases from the literature and has divided them into three groups according to the origin:

1. Those arising from a primary carcinoma of the cervix with spread upward by continuity.

2. Those primary in the fundus with spread downward.

3. Those in which no primary lesion can be recognized, the carcinoma appearing as one continuous tumor lining the endometrium symmetrically.

According to this classification, the case here reported in all probability falls within the first group, for, although absolute proof cannot be advanced because the cervix was never removed, the very first examination at the Morrisania Hospital showed a lesion sufficiently large to warrant its acceptance as being primary.

Diffuse carcinoma involving not only the body and the cervix but also the vagina has been recorded only twice, a case by Schauenstein[4] and one by Gellhorn.[5] The above case which shows definite involvement of the vagina without infiltration of the parametria must be considered as the third case on record.

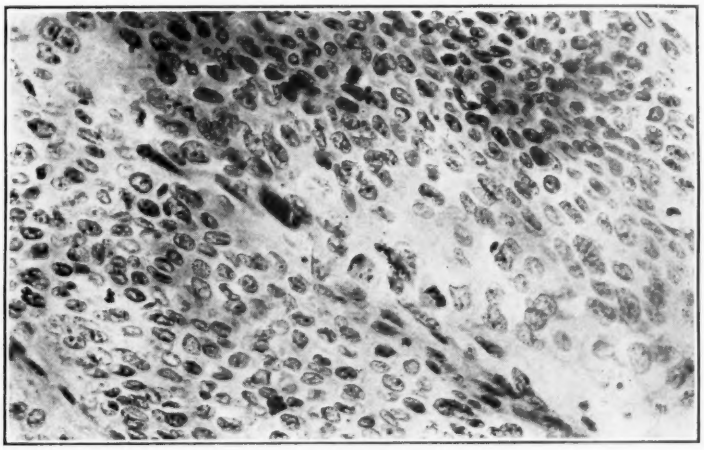

Fig. 5.—High power. Keratohyalinization is seen as well as numerous mitotic figures.

R. Meyer[6] believes that the spread of the carcinoma occurs along the surface of the normal endometrium with secondary penetration toward the base. Cases in which areas of squamous cells have penetrated into the glands and then deeply into the endometrium have been observed to support this contention. The case under discussion fails to show even the faintest evidence of the presence of normal endometrium so that the method of spread of the carcinoma cannot be determined. The complete replacement of the endometrium by the carcinoma is in itself of interest.

That a metaplasia of the endometrium may have occurred must be considered. As R. Meyer[6] has pointed out, infection undoubtedly plays a rôle in the change to squamous cells. Almost every case reported has occurred in women in the senium and has been accompanied by a pyometra. This is also true of the case reported here. In addition, treatment with intrauterine radium may also have been an influence.

As has been stated, treatment of carcinoma of the cervix by radiotherapy has merited universal adoption. However, the possibility of spread to the fundus with the formation of a pyometra brings up the question of further therapy. Where the pyometra is recognized, treatment of this condition alone is indicated. Where spread of the carcinoma to the fundus and even through it, as has been reported,[7] has taken place, the advisability of removal of the uterus surgically must be entertained.

SUMMARY AND CONCLUSIONS

1. A case of diffuse carcinoma of the uterus accompanied by pyometra, for which hysterectomy was performed, is presented.

2. Its origin was probably in the cervix with extension upward to the fundus as well as downward to the vagina, leaving the parametria uninvolved.

3. The possibility of the occurrence of spread to the fundus from a primary carcinoma of the cervix with pyometra formation must be considered and here the question of hysterectomy must be entertained.

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145 West Eighty-Sixth Street

MISSED ABORTION—A HEMATOMA MOLE

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MRS. H. O. (University Hospital No. 52859), aged twenty-five years, white, admitted March 3, 1936, dismissed March 22, 1936, on tenth postoperative day. Operation March 11, 1936, hysterectomy complete, spinal anesthesia; 17 mg. of pantocaine.

This patient entered the hospital because she knew she had a uterine tumor; because she had a period of amenorrhea from April, 1935, until December, 1935, and because she had irregular menstrual periods from December, 1935, to March, 1936. This latter flowing would occur every two to fourteen days.

Her last normal menstruation was then eleven months ago.

She was the mother of 2 children, aged four and two years, the last child was born in November, 1933. She started to flow six weeks later and had a normal menstrual cycle until April, 1935.

She consulted a doctor in June, 1935, who made the diagnosis of probable pregnancy. In October, 1935, four months later, she consulted her physician because her abdomen failed to enlarge. Her doctor told her he believed the fetus was dead and that at some future time she would deliver a dead fetus. Nothing happened so she waited until January, 1936, before she was examined again on account of irregular vaginal bleeding. She was referred to the University Hospital with the diagnosis of a soft fibroid.

There were no other pertinent facts in her history and her general physical examination was negative. She had an appendectomy in 1927, and was operated upon again in 1928 for adhesions.

Pelvic examination showed good perineal support, cervix eroded on posterior lip, body of uterus forward, soft, regular in outline, size of a three months' pregnancy,

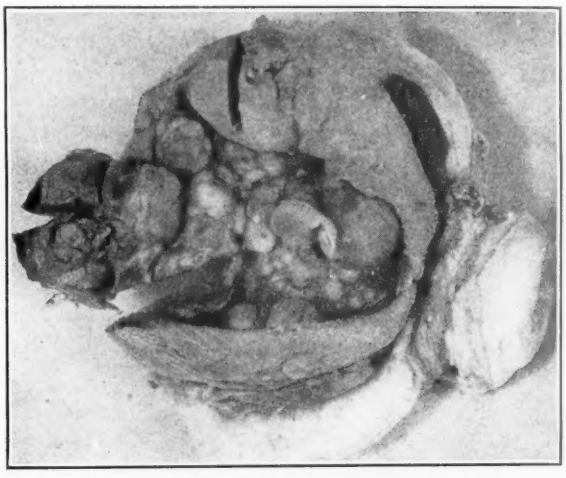

Fig. 1.—Uterus and mole, actual size. Embryo is 14 mm. long.

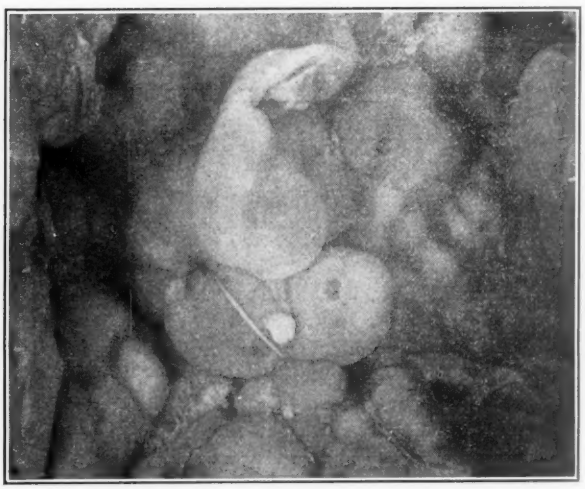

Fig. 2.—Embryo, cord, and placental tissue, 3× normal size.

adnexal regions and culdesac negative. A Friedman pregnancy test was done and the report was negative. Diagnosis: Probably soft fibroid.

Operation on March 11, 1936, midline incision revealed a soft uterus size of a three months' pregnancy. A complete hysterectomy was performed and the correct diagnosis was not made until the uterus was cut open. There was a gush of chocolate-colored amniotic fluid, the interior of the uterus filled with a blood mole presenting a polypoid appearance (Fig. 1). Later a small fetus measuring 14 mm. was ob-

served in this mass of polypoid growths. This fetus was from five to seven weeks of age with a distinct umbilical cord, external indications of eyes, buds representing the extremities (Fig. 2).

Microscopic Findings: There were a number of sections taken from the uterine wall, including the placental tissue. There was no appreciable change in the muscularis. The endometrial glands were greatly distended and filled with a precipitate of albuminous fluid. Stroma cells were comparatively large and the stroma in some areas was quite edematous. Epithelial cells showed little change and only in a few areas was there definite decidual reaction. The placental tissue was largely necrotic but a number of villi near the endometrial surface showed fairly normal syncytial cells which stained very well. The stroma of some of these villi was quite normal in appearance. No blood vessels were seen within these villi. There was massive hemorrhage into the placental tissue. Much of the amniotic surface was necrotic, although in other areas a thin zone two or three cells deep remained viable (Fig. 3).

Diagnosis: Hematoma mole.

Fig. 3.—Section of the uterine wall, showing distended glands, and the border of the placental tissue, with a few viable villi.

As Taussig points out, the size of these embryos is fairly constant ranging from 8 to 15 mm. in body length. This definitely establishes the hematoma mole as a retained abortion from between the fourth and seventh weeks of gestation.

In cases associated with continued growth of the fetal membranes after embryonal death, there is a definite increase in the size of the cavity, and an early hydramnios, as was present in this case.

Usually the uterus will expell these products of conception, but in this instance there was only a little irregular uterine bleeding from December, 1935, although the patient's last menstrual period was April, 1935, eight months previously. There were no signs of cervical dilatation in March, 1936, eleven months after the last normal menstrual period. The Friedman test for pregnancy was negative. This test should be positive if there are any active live products of conception present in the uterus as would be obtained in an incomplete abortion, hydatidiform mole, or chorionepithelioma. This test is a placental sign and should be positive in the presence of active placental tissue.

A case of missed abortion varies in its duration from one or two months to one or two years. This case was a missed abortion of eleven months' duration.

1234 Medical Arts Building

ATELECTASIS AS A COMPLICATION OF OBSTETRIC ANALGESIA

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AT THE present time obstetric analgesia is a much discussed subject among both the laity and the profession. The very multiplicity of methods and drugs used is prima facia evidence that the ideal combination has not yet been found, and it is not my purpose to enter into any lengthy debate as to the relative advantages or disadvantages of the various methods advocated, but to call attention to a rather serious disadvantage associated with an otherwise satisfactory form of obstetric analgesia, namely nembutal (pentobarbital sodium) and paraldehyde.

At various times we have used innumerable types of obstetric analgesia, including morphine and scopolamine, Gwathmey technic, McCormick modification of the Gwathmey technic, the barbiturates alone or in various combination and others. We found the combination of nembutal by mouth and paraldehyde in olive oil by rectum as advocated by Conn, Leighton, and Ross to be the most universally satisfactory in our hands, and it is today our routine procedure for uncomplicated cases. Having adopted this technic because of its almost universal amnesia, its simplicity of administration and its safety factor, it is with regrets that the following cases are very briefly summarized:

CASE 1.—K. K. (No. 22444), aged thirty years, para i, admitted to Ideal Hospital with ruptured membranes but no pains. Labor began at 1:00 P.M. August 20, and continued with good pains.

At 1:20 A.M., next day, analgesia was begun. Progress was satisfactory. At 10:00 A.M., respirations suddenly increased to 45, the patient became slightly cyanotic, pulse 110. A half hour later respirations were still labored, caput presenting. A normal live baby was delivered by low forceps.

The patient was given inhalations of carbon dioxide and oxygen, and injections of caffeine sodium benzoate were begun. A chest examination rather hurriedly done revealed diminished breath sounds at the lower left base with occasional coarse râles, and a tentative diagnosis of atelectasis of the left base was made. The patient was put in an oxygen tent, caffeine continued together with frequent changing of position. In a few hours the patient's respirations were 30, less labored and the cyanosis was gone. X-ray showed: "Slight haziness at base of left lung. Heart not retracted to left. Possible clearing atelectasis." The patient's convalescence was uneventful and she was discharged on the tenth day postpartum with a well baby.

CASE 2.—R. S. (No. 23009), aged thirty-three, para vi, admitted to Ideal Hospital Oct. 22, 1936, in labor. At 10:50 A.M., analgesia was begun and at 12:40 P.M., normal spontaneous delivery of a live baby occurred.

At 4:00 P.M., respirations increased rapidly to 40, pulse 120. Patient cyanotic. Axillary temperature (patient restless) 99° F. Chest examination revealed diminished breath sounds in right axilla, coarse râles over anterior chest to right of the sternum. Impression was atelectasis of right chest. X-ray was not taken. Patient was given carbon dioxide and oxygen inhalations, caffeine sodium benzoate and placed in an oxygen tent. Position frequently shifted. Her recovery was almost as rapid as onset. She was discharged on the tenth day postpartum with a well baby.

CASE 3.—R. B. (No. 23116), aged twenty-nine, para i, admitted to Ideal Hospital Nov. 6, 1936. Contractions irregular, no dilatation. At 4:40 A.M., analgesia begun and at 8:00 nembutal, gr. iii, given additional. At 1:40 P.M. caput presenting with perineal bulging. Left lateral episotomy, and low forceps. Normal, live baby, patient's condition good. About an hour later respirations 32, pulse 120. No cyanosis, caffeine sodium benzoate given and position frequently changed. At 4:00 P.M, respirations 42, pulse 132, temperature 101.4°, cyanotic. Chest examination revealed diminished breath sounds over the lower right side of the chest with diminished expansion. Few coarse râles. Impression: Atelectasis or partial collapse. Carbon dioxide and oxygen given. Rapid digitalization begun and patient placed in an oxygen tent. A bedside x-ray was taken which showed, "slight irregular density mesial half lower right lung. Heart on right; maybe due to atelectasis"

Convalescence uneventful and the patient was discharged with a well baby on her tenth day postpartum.

These patients had nothing in common except the analgesia. They had no cold or cough on admission and labor was not unduly prolonged in any case. Naturally the question will be raised, "Were these cases of true atelectasis?" In only one case are we certain but the progress and clinical signs seem to justify the diagnosis. We have no way of proving the atelectasis due to the analgesia used. It might have occurred with the use of other drugs or general anesthesia, but on a fairly active service we have never had it occur with other forms of analgesia or general anesthetic. It could even have occurred without any analgesia or anesthetic for we have seen one case of spontaneous atelectasis occur in a seven months', otherwise normal pregnancy. The diagnosis in this case was confirmed by several internists and by x-ray. Granting that it could have occurred without any analgesia or anesthetic or with other analgesias or anesthesias, the short interval between the occurrence of three cases all having the same medication points strongly to the medication as the etiologic factor.

The mechanism of atelectasis (passive) in these cases is most probably due to a plugged bronchus. With the patient in a fairly deep stage of narcosis, it is easy to understand how mucus may be inspirated, plug a bronchus and cause atelectasis or partial collapse.

A review of the recent literature reveals no reported cases of atelectasis occurring in conjunction with the use of obstetric analgesia. Whether these cases are isolated incidents or whether this is a not uncommon complication, I am not prepared to say at present. The ultimate outcome was highly satisfactory, but it is still a complication to be prevented if possible. There is nothing more disconcerting than to complete a labor, apparently satisfactorily, then receive a hurried call from the interne several hours later that the patient has suddenly "gone bad." Many glowing reports of the safety and advantages of various forms of analgesia are reported. It is equally important that all unsatisfactory results and complications be carefully noticed and reported lest we, in an earnest endeavor to alleviate the pain of labor, actually endanger the safety of the patient.

The administration of atropine sulphate gr. 1/150 when analgesia is effective is suggested as a prophylactic measure.

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134 WASHINGTON AVENUE

A SATISFACTORY LEG SUPPORT FOR THE LITHOTOMY POSITION

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THERE has been considerable discussion as to the proper method of placing the patient in the lithotomy position for obstetric and gynecologic operations. More recently Thompson has shown that foot-drop following delivery is associated with pressure over the head of the fibula rather than with injury to the sacral plexus due to rotation of the fetal head in the pelvis. Such injury may be caused by most of the stirrups in general use today.

In obstetrics it is also desirable to permit mobility of the legs for two reasons: first, many of the patients are kept in this position for varying periods of time before the induction of anesthesia and the actual delivery, and second, in some of the obstetric procedures it is necessary to place the patient in the Walcher position

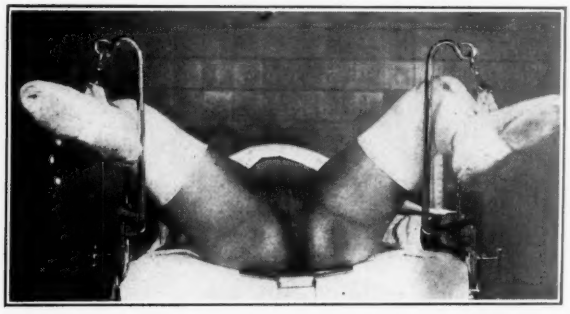

Fig. 1.—Patient in lithotomy position, using "beach slippers" to suspend the legs.

to facilitate delivery. For these reasons it is undesirable to have the legs fixed to a knee support. In our own experience we have found it unnecessary to employ two assistants to hold the legs in the proper position.

The method which we have used with satisfactory results for the past three years is shown in Figs. 1 and 2. The feet are suspended from the upright bars by means of straps attached to ordinary "beach slippers." These slippers are inexpensive and are made of canvas so that they can be easily washed. The zipper permits easy manipulation and prevents the foot from slipping out of the stirrup during excitement. The straps are sewn to the sides of the slippers so that the pressure is distributed over the plantar surface of the foot. There is no circular pressure around the foot or the ankle as is obtained by other methods. When the patient "pushes" there is no direct contact of the leg with any metal portion of the stirrup, and therefore padding is not necessary. The upright bars are on the medial aspect of the legs. When the patient is anesthetized, the legs become abducted by their own weight and plantar flexion of the feet is impossible. There can be no pressure over the head of the fibula. The patient in Fig. 1 is not under the influence of anesthesia, so that complete abduction of the leg is not demonstrated.

For those who find it necessary to employ the Walcher position during part of the procedure, the swivel attachment of the upright bars is available on many of the operating tables. This permits the angle of the bars to be changed so that the legs can be lowered to any desired position.

In our own experience this method has been entirely satisfactory since we have had no cases of foot-drop or injury due to pressure on the legs or feet. If offers the following advantages:

1. The slippers are inexpensive, easily washed, and comfortable. (Sizes 8 and 9 are suitable for the average patient.)

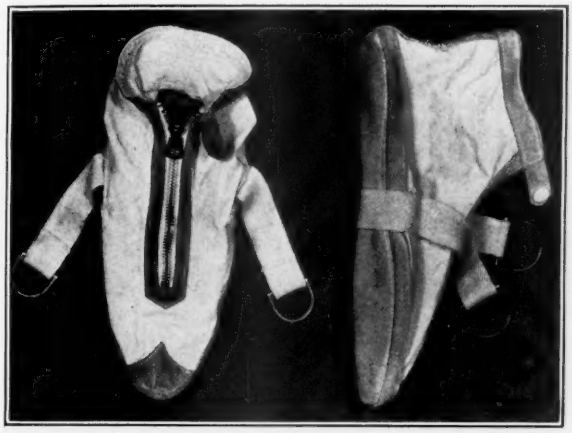

Fig. 2.—Photograph of slippers with straps attached.

2. Eliminates any external pressure over the legs and ankles.
3. Prevents plantar flexion of the feet.
4. Permits mobility of the legs while the patient is awake.
5. Permits the use of the Walcher position without difficulty.

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THE INCIDENCE OF TRICHOMONAS VAGINALIS INFECTIONS

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At the University of Colorado School of Medicine and Hospitals a total of 325 nonselected white patients was personally examined for the trichomonads. Of these, 145 were pregnant patients at various stages in the Antenatal Clinic for routine care. The remainder, or 178 cases, were patients registering in the Gynecological Clinic. Of the total 325 cases, the parasite was found in 59, or 18.1 per cent. Of these 18, or approximately 30 per cent, complained of symptoms. In the series of 145 pregnant cases, 25, or 17 per cent, were found infected. Of these 6, or 24 per cent, complained of symptoms. In the nonpregnant series 34, or 19.1 per cent, presented the trichomonads. Of these 12, or 35.3 per cent, complained of symptoms.

In the series of 178 patients examined in the Gynecological Clinic 11, or 6.2 per cent, were found to have positive smears for gonorrhea. Of these 11 patients only 3 were infected with both the gonococcus and the parasites. Collis demonstrated the gonococcus in 20 per cent of 47 patients examined at the General Hospital, Birmingham. The frequency of the double infection convinced Collis that gonorrhea may reduce the resistance of the vaginal tract, making subsequent trichomonas infection more frequent.

The findings in this series would indicate that possibly the association with a gonorrheal infection is coincidental.

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A NEW TYPE OF SYRINGE ADAPTED FOR THE TREATMENT OF ENDOCERVICITIS

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THE treatment of chronic endocervicitis has been attended always with considerable difficulty. There is a distinct class of cases characterized by stubborn and persistent leucorrhea of various types but without marked laceration or erosion. Many of these cases, although the glands are deeply infected, do not show marked nabothian cyst formation grossly. The classical method of treating these cases usually has been the local application of drugs in the form of caustics, ordinarily some form of the silver compounds, antiseptic powders, or injection of various drugs into the cervix. Medicated pastes have been injected into the cervical canal. Various forms of cautery treatment have been effective usually in more severe cases with anatomic lesions, but particularly in specific cases of chronic endocervicitis, the gentle and judicious use of chemical agents is still the method of choice.

Application of liquids in the form of silver nitrate, mercurochrome, iodine, the anilin dyes, etc., is ineffectual often because the surface merely is treated, and the drug has slight chance of penetration and its germicidal power is necessarily limited. The application of a water soluble jelly of antiseptic nature would seem to be more rational. This can be delivered into the cervical canal, dammed or blocked at the external os by tampon of nonabsorbent cotton. The gradual liquefaction of a jelly allows more prolonged contact with the endocervix and improved chance for penetration. Water soluble jellies or ointments are readily prepared with gum tragacanth, glycerin, and water, using mercurochrome, iodine, potassium iodine, phenylmercury nitrate, merthiolate, etc. This, we have found to be the most convenient of all methods in the treatment of gonorrhea limited to the cervix, where extreme gentleness is absolutely necessary due to the danger of inciting an ascending infection.

The loading of the ordinary barrel type of syringe with ointment or jelly is inconvenient and difficult, and the instrument which we have to describe is a side-

loading type of syringe with a large slot which fits perfectly into a slightly larger outside barrel, to the inside of which is soldered a cover for the slot of the inner barrel (Fig. 1). The composition plunger is forced through the inner barrel which allows little or no leakage of the jelly. This plunger is cup-shaped and may be of rubber or better of rubberoid composition. Pressure on the plunger (Fig. 1) expels the jelly through a tip six inches long and gauged to accommodate the curve of the cervical canal. These are in graduated sizes and are adapted to any type of cervical canal. Injection with this method is easy, harmless to the patient, as the treatment is accomplished carefully and under very low pressure, only sufficient jelly being injected to fill the cervical canal. Capacity of the inner barrel is sufficient to contain treatment for several patients with the tips detachable and boilable, so that one-half dozen or more patients may be treated in rapid succession from a single loading of the instrument.

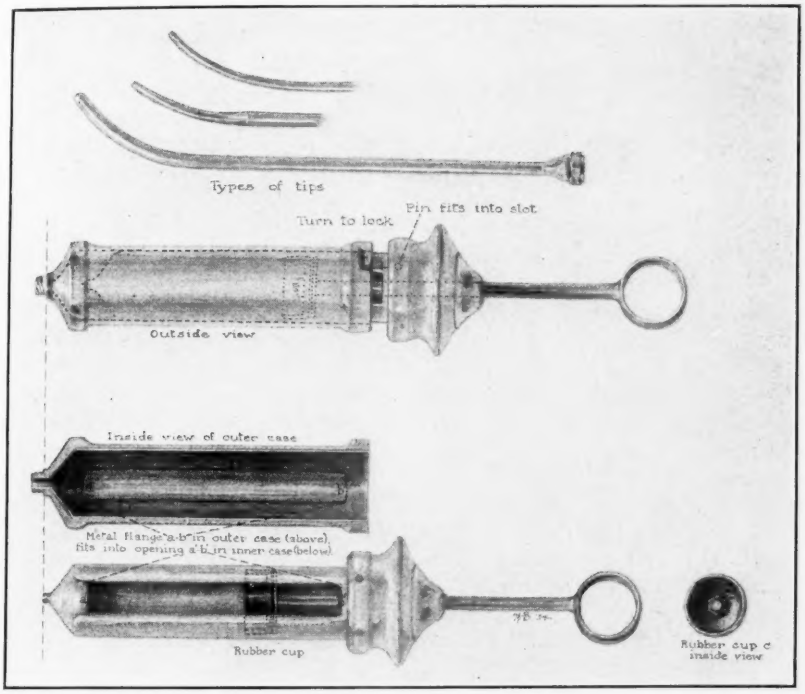
Types of tips
Turn to lock
Pin fits into slot
Outside view
Inside view of outer case
Metal flange a-b in outer case (above) fits into opening a'-b' in inner case (below)
Rubber cup
Rubber cup c
inside view

Fig. 1.

The instrument may be taken apart and washed easily. Owing to the easy solubility of the medium used, water is quite sufficient for cleansing the syringe. Such an instrument, therefore, is ideal for dispensary use, being easily loaded, cleaned and ready for repeated use. This instrument we have found very convenient in office as well as in dispensary practice. The instrument may be adapted readily to other locations or purposes where injection of an ointment by means of a syringe with a long nozzle is indicated.

Department of Book Reviews

Conducted by Robert T. Frank, M.D., New York

Review of New Books

Obstetrics

Schumann has written *A Textbook of Obstetrics*[1] which is most carefully planned and well executed. Each word of the text appears to have been weighed. It is designed for students and practitioners, written by a man long engaged in the practice of the obstetric art, and based on a wide clinical experience. The pathology of each disease is taken up in detail, simply and clearly stated. Debatable and purely theoretical questions are considered but not emphasized. All well-authenticated methods of treatment are described. The writer then indicates his own preferences—for example the use of morphine and scopolamine for analgesia—after detailing all analgesics and anesthetics.

The introductory chapters on anatomy, physiology, fertilization and growth of the ovum are short, include all modern conceptions and are very well illustrated.

In normal labor the author suggests that the Credé maneuver be practiced 30 minutes after birth of the child if the placenta has not separated. If this is unsuccessful, the cord may be clamped and the placenta left in situ for 24 hours. With this we fully agree. But not with his next sentence in which he says, "It is better, however, to perform manual removal, after an interval of 2 hours, or if hemorrhage or any other indication arises." The general practitioner had better be counseled to keep his hands out of the uterus unless very vital indications develop. In abnormal conditions, Schumann is terse and to the point. "There is no expectant treatment for placenta previa." Naturally he modifies this for special circumstances. He prefers cesarean section in placenta previa unless the case is mild, as for example in multiparae well advanced in labor, where simple rupture of the membranes may suffice. In premature detachment of the placenta cesarean section is always advocated for an undilated cervix, and if the uterus is found soft, boggy, and containing hematomata, hysterectomy should complete the operation. The description of eclampsia is fortunately devoid of the innumerable and confusing theories and hypotheses which so often becloud the issue for the practitioner. The most conservative measures are advocated and only in the severest cases is labor induced in multiparae or those well advanced in labor, by means of rupture of the membranes. Rarely is cesarean section practiced for this indication.

The chapter on ectopic gestation is very ample and beautifully illustrated. For puerperal sepsis he believes that local treatment has little place in its management. The anomalies of the birth canal are very lucidly discussed. This volume concludes with a discussion of operative obstetrics. In forceps delivery, the Kielland forceps are stressed. Chapters on breech extraction, version, and cesarean section conclude the text. At the end of the volume is a short but carefully selected bibliography.

[1] **A Textbook of Obstetrics.** By Edward A. Schumann, M.D., F. A. C. S., Professor of Obstetrics, School of Medicine, University of Pennsylvania, etc. 780 pages with 581 illustrations. W. B. Saunders Company, Philadelphia, 1936.

The illustrations are unusually numerous for a book of this size (581 pages). They show careful choice in their selection, many of them derived from well-known sources to whom all due credit is given.

The author has admirably fulfilled his promise to write this book for the student and practitioner, who will find it both easy to study and to refer to, with clear-cut answers to the many questions which arise in the study and practice of obstetrics.

—*R. T. Frank*

Titus has written a book on *Management of Obstetric Difficulties*,[2] designed for obstetric specialists but also to appeal to the general practitioner who, after all, does most of the obstetrics throughout the country, as well as for obstetric internes and residents. It covers mainly the abnormal phases of obstetrics, leaving normal obstetrics to general textbooks on this subject.

The volume begins with the causative factors of sterility and their treatment. Apparently the author credits the results and interpretations obtained by Ogino and Knaus.

This is a well-arranged book with careful and conservative description of the manifold difficulties encountered in the practice of obstetrics. It deals with the diseases of the fetus, such as monstrosities, chorionepithelioma, hydramnion and oligohydramnion. A considerable portion is devoted to the diagnosis and treatment of abortion. The author advises prompt emptying of the uterus for missed abortion. He believes that the Friedman and the Aschheim-Zondek tests become negative ten days after death of fetus. A very complete discussion of ectopic gestation is given as well as that of placenta previa and premature detachment of the placenta. The various methods of operative obstetrics are described, including forceps, cesarean section and mutilating operations on the fetus.

Most of the maneuvers necessary throughout obstetric practice are carefully detailed, including methods of anesthesia, saline and glucose injections, as well as transfusion of blood. The book is excellently illustrated.

—*R. T. Frank*

Williams Obstetrics,[3] a classic in obstetric literature and a standard textbook for a generation, appears in the seventh edition, five years elapsing since the previous revision. The revision and enlargement of the work has been made quite fittingly by H. J. Stander, who was long and closely associated with J. Whitridge Williams in the teaching and practice at Johns Hopkins Hospital. It is evident from a study of the book that the contributions to the literature of obstetrics as a speciality, for the past five years, have been evaluated with a singular discernment. One feels that such articles as have had their worth-while points incorporated in the rebuilding of the text or as have been included in the bibliography may well be regarded as of distinct merit in obstetric literature. The chapter bibliographies are thus relatively long, but this is in line with Williams' statement in the preface of his second edition that he wished to give full credit to all who had played a part in the development of obstetrics. The text has been increased by one hundred and thirteen pages, due to added material in a rearrangement of the former text and the inclusion of three new chapters on physiology, anesthesia and analgesia, and urological pathology.

In the first of these new chapters, Stander discusses the sex hormones and their relation to menstruation, pregnancy, parturition, and lactation. The known facts

[2]**The Management of Obstetric Difficulties.** By Paul Titus, M.D., Obstetrician and Gynecologist to the St. Margaret Memorial Hospital, etc. 879 pages, with 314 illustrations, including four in color plates. The C. V. Mosby Company, St. Louis, 1937.

[3]**Williams Obstetrics.** By Henricius J. Stander, Professor of Obstetrics and Gynecology, Cornell University Medical College, etc. Seventh edition, a revision and enlargement of the text originally written by J. Whitridge Williams. With 278 illustrations and 1269 pages. D. Appleton-Century Company, New York, 1936.

and the recent demonstrations of reproductive physiology are reviewed in a consideration of the present understanding of the causes and mechanisms of the menstrual cycle and early reproductive phenomena.

In discussing the mechanism of the pregnancy test of Aschheim and Zondek, he differentiates between the gonadotropic hormones of the hypophysis and the placenta. The suggested hormonal control of origin of the onset of labor is reservedly speculated upon, a diagram outlines the present concept of the mechanism of gland control. The probable factors in the mammary gland reaction after labor are described; and Kurzrock's clinical use of the anterior hypophyseal hormone, prolactin, is mentioned. Stander is candidly reserved in his acceptance of many of the newer theories of hormonal influences but feels there is a strongly suggestive biologic significance in many phenomena of obstetrics.

The chapters on the physiology, mechanism, and conduct of labor leave little to be desired. A commentary on the contributions to this phase of obstetrics is seen in the inclusion of not over a dozen references from the literature in the past five years in the appended bibliography. The methods of conduct of labor of the New York Lying-In Hospital are included here. Stander reviews the newer preparations of ergot derivatives but expresses no opinion, due to lack of clinical experience, as to their advantages over the older preparations.

In this section appears a new chapter on amnesia, analgesia, and anesthesia in labor, in which the history, agents, action of the drugs and various technics now in use, with their contrasted advantages and disadvantages, are discussed. Apparently the barbiturates are enjoying a swing on the pendulum of popularity, yet Stander regards the almost inevitable excitation consequent upon their use as an objectionable feature, and cannot regard them as ideal analgesics for obstetric cases, alone or in combination with other drugs; he personally limits their use to a very small and carefully selected group. His preference is evidently stated in the choice for his clinic practice of morphine and scopolamine, supplemented by ether and oil by rectum, and by nitrous oxide and oxygen during delivery and repair in the average case.

The section on obstetric surgery is clear in detail of technic, well illustrated, and conservative as to indication. The discussion of cesarean section upholds the place of the low cervical section, the discussion on prognosis plainly displays the dangers of the promiscuous use of the abdominal route of delivery. As might have been expected the section on the toxemias of pregnancy, a subject on which Stander has written much, reflects his personal ideas and investigations. There is a full discussion of the theory and the many lines of treatment. Stander regards the early termination of pregnancy in the unimproving preeclamptic as a desirable measure, and for the convulsive toxemia uses a modified Stroganoff regimen. His treatment is of the conservative school.

The third new chapter in this edition discusses the nondegenerative, or the inflammatory, lesions of the urinary tract. Here in a section illustrated with a number of excellent urograms are discussed from a viewpoint of modern diagnosis and treatment the topics of pyelitis, cystitis, and ureteritis. The anatomy and physiology of the urinary tract in pregnancy are described. Other less frequent lesions as stricture, ptosis, and tuberculosis are also discussed. The various methods of bacteriologic research and of kidney function tests are detailed and evaluated.

There are many other evidences of revision which must remain untouched. In his revision of this long and deservedly popular volume, Stander has well preserved the original principles of scientific and conservatively practical obstetrics as written by J. Whitridge Williams, and at the same time has brought the text fully abreast of the advances in the subject to which he himself has made no more notable contribution than this revision.

—Philip F. Williams

This book, *A Manual of Practical Obstetrics,*[4] has been written to present the subject of Clinical Obstetrics in as practical a form as possible. It is felt that the author has succeeded very well in his effort. He has left out statistics and theoretical considerations largely and has expressed very definitely his own views and methods of handling difficult situations. The illustrations which are borrowed in part from other works serve well to illustrate the text.

Anatomy and physiology are briefly discussed. Antenatal care is gone into in much detail; here as in other sections of the book there seems to be a considerable tendency to recommend proprietary medicines by name. In discussing the diseases complicating pregnancy the author does not mention the use of early cesarean section in diabetes, a procedure which is often used in this condition in the United States. The directions for the conduct of pregnancy, obstetric diagnosis, mechanism and conduct of normal labor, care of the patient during labor are gone into thoroughly, simply, and concisely, with practical suggestions. The lateral position suggested is not in use in the United States and the frequent interspersing of illustrations of patients in the dorsal with those of patients in lateral positions are confusing. The author does not favor rectal examinations in labor.

A rather marked error in proofreading occurs on page 66; "Sometimes it is more convenient to remove the baby before stitching a torn perineum." In the able chapter on stimulants and anesthetics of labor, the barbiturates are not mentioned. Follow-up examination over a sufficient period of time is stressed in the care of the puerperal patient. The abnormalities of labor, hemorrhages, and the treatment of various complications are well presented. The author evidently feels that cesarean section has not been employed with sufficient frequency in Ireland for placenta previa. The Rotunda method of treating convulsive toxemias of pregnancy is the author's choice. The Stroganoff treatment is also described. There is a fine chapter on puerperal sepsis.

The book concludes with three chapters written by colleagues, one on the Newborn Infant by Collis, which is a fine presentation; a chapter on Radiology written by McDonogh which stresses the importance of roentgen ray examinations in obstetrical practice and a concluding discussion of Blood Typing and Blood Transfusions by Dockeray.

This is an excellent presentation of practical obstetrics, a working manual, eminently suitable for the general practitioner.

—*Philip F. Williams*

An ill-defined symptom-complex, *The Toxaemias of Pregnancy,*[5] forms the subject matter of this very thorough and comprehensive review of the literature and discussion of the many problems encountered in the prevention and treatment of this state of altered metabolism in pregnancy. Dr. McIlroy is to be congratulated upon the thoroughness with which she has reviewed the world-wide literature of the problem and the splendid arrangement which she has made of this material. As a review it presents the findings, facts, and opinions from every country with the exception that German literature is seemingly incompletely covered.

The book takes up the statistical aspect of the subject stressing maternal and fetal mortality, then covers the theories and classifications and follows with the functional studies of the normal and abnormal pregnancy. Antenatal care is exhaustively studied under the subjects of nutrition, diet deficiency, and relation of weight changes of toxemias.

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[4]**A Manual of Practical Obstetrics.** By O'Donel Brown, Assistant Gynecologist, Sir Patrick Dun's Hospital, Dublin, etc. With 10 plates, some in color, and 236 illustrations, 363 pages. William Wood & Company, Baltimore, 1936.

[5]**The Toxaemias of Pregnancy.** By Dame Louise McIlroy, Consulting Obstetrician and Gynaecologic Surgeon, Royal Free Hospital, etc. 355 pages. William Wood & Company, Baltimore, 1936.

Dr. McIlroy regards the theories and classification as still incomplete and poorly founded. She suggests further research on the endocrine aspect and the deficiency origin of this condition. In discussing symptoms and signs of toxemia, she feels that they are, for the most part, effects of altered metabolism on the various systems and organs and represent the degree of increasing recessions of defense.

Chronic nephritis in pregnancy is considered as an entity and forms the subject of a very able section, as does also the contribution of her coworker, Jane McIlroy, on the eye changes of toxemia. Dr. McIlroy emphasizes the importance of antenatal care and prophylaxis and stresses the conservative medical treatment with obstetric interference, practiced only when indicated.

This very excellent presentation of the subject should be in the hands of all obstetricians.

—*Philip F. Williams*

Siedentopf in his monograph *Die Bekaempfung der eklamptischen Schwangerschaftserkrankungen*[6] gives us a wide discussion of the modern views on the prevention and treatment of the late pregnancy toxemias. Basing his study upon the clinical material of the Leipzig school, supplemented by his researches in physiological chemistry during his postgraduate work in the United States, and a critical review of the recent literature, he offers a very thorough consideration of this difficult problem.

Siedentopf, remarking upon the prophylaxis of the condition, under the caption prenatal care, states that 300 deaths occur in the 2,000 eclampsias met annually in Germany, and refers to the very high death rate from the disease in the United States. The subject of antenatal hygiene is meticulously detailed. The treatment of preeclampsia, he insists, should be directed along conservative lines toward avoidance of eclampsia; yet his attitude toward the use of cesarean section is eminently sane. Siedentopf discusses the therapy of the three lines of treatment, active radical, conservative, and middle line, from many angles. There are chapters of merit on the late effects of toxemias, and of their recurrences. In the conclusions the author states that so long as the etiology remains undisclosed and as long as there is no clear causal therapy our best defense against the toxemias is a constant and increasing effort against their occurrence.

This, the first German monograph on the subject in ten years, is a splendid presentation on the prevention and treatment of the toxemias and deserves to be widely read.

—*Philip F. Williams*

Therapeutica das Syndromes Gravido-Puerperaes[7] (*Treatment of the Gravid-Puerperal Syndromes*) by J. P. de Camargo in its second edition is a relatively short book whose material is presented in an easy-assimilable form.

A great variety of complications which may occur during pregnancy are discussed from the standpoint of etiology, symptoms, prognosis, and treatment. They include such widely diverse subjects as pernicious vomiting, varicose veins, infections, tuberculosis, chorionepithelioma, hydramnios, and many others.

Throughout, the author's point of view is sane and practical, and the information given is short and concise. The only faults to be found are the almost complete ab-

[6] **Die Bekaempfung der Eklamptischen Schwangerschafts-Erkrankungen.** Von Heinrich Siedentopf, Oberarzt der Universitaets-Frauenklinik zu Leipzig. 86 Seiten. Johann Ambrosius Barth, Leipzig, 1936.

[7] **Therapeutica das Syndromes Gravido-Puerperaes.** Par Dr. Joao Pereira de Camargo, livre docente de medicina da Universidade do Rio de Janeiro, etc. 2. a edição correcta e muito augmentada. 376 pages. Freitas Bastos, Rio de Janeiro, 1936.

sence of illustrations as well as the tendency toward the utilization of hormonal preparations where their value may be doubtful, as in the pernicious vomiting of pregnancy. A better correlation of the material would also improve the book.

—Frank Spielman

This is a large volume[8] by numerous authors and is published by the Obstetric and Gynecological Clinic "Luigi Mangiagalli" of Milan in memory of the thirtieth anniversary of its foundation, and dedicated to the memory of Mangiagalli. The first paper is by Alfieri, the Director of the Clinic, who reports on 7,000 laparotomies performed between the years 1927 and 1936. Of these patients only 325 were operated upon per vaginam. The total mortality in the 7,000 was 3.55 per cent. Of the numerous articles there is one on embolism and thrombosis after operation, another dealing with 57 cases of hydatid mole and 8 of chorionepithelioma. Considerable space is devoted to Alfieri's method of shortening the round ligaments for retroflexion by laparotomy. The ligaments are cut across at their uterine end and the free end then implanted into the posterior surface of the uterus after having been passed through the broad ligament below the utero-ovarian ligament, somewhat in the manner of Webster-Baldy. The huge activities of the clinic are fully described in this monograph in which very careful attention to the literature, with bibliographic references, has been given.

—R. T. Frank

Staehler in *Arbeitsphysiologie der Schwangerschaft*[9] discusses the energy output of labor, the respiratory changes during labor and the effect of the various types of physical activity during pregnancy.

He has measured for the first time the energy output of labor in calories and states that a single contraction produces an average of four calories and that the highest production which he has measured was equivalent to a thirty-kilometer march; comparisons are made between the work of labor and of various occupational stresses.

The respiratory exchange of normal pregnant and parturient women was studied from a standpoint of frequency and volume of the respiratory excursions. Staehler discusses the minute volume interchange during the dilating and expulsive stages of labor, and the variations caused by various reflex phenomena. The effect of physical work in pregnancy was studied in relation to the influence it had upon physiology of the circulatory system. As might have been expected moderate exercise was found beneficial and extreme degrees of physical exertion were dangerous.

This is an interesting contribution to the physiology of pregnancy.

—Philip F. Williams

In *Die Vitamine der Milch*,[10] Neuweiler takes up the physiology and relationship to various phases of metabolism and stages of development of the known groups of vitamins. He then reviews the researches which he and other investigators have made upon the vitamin content of human and cow's milk. There are two colored photomicrographs to illustrate the demonstration of vitamin C in the lactating mammary gland.

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[8] **Nel Trentesimo di Fondazione, Della R. Clinica Ostetrico-Ginecologica "Luigi Mangiagalli" di Milano.** 956 pages. Fidenza. Tipografia Adamo Mattioli. 1936-XIV.

[9] **Arbeitsphysiologie der Schwangerschaft.** Von Dr. Med. Fritz Staehler, Oberarzt an der Universitaets-Frauenklinik in Frankfurt a.M. Mit 16 Kurven und 17 Abbildungen im Text. 103 Seiten. Verlag von S. Karger, Berlin, 1936.

[10] **Vitamine der Milch.** Dr. Med. Walter Neuweiler, Universitaets-Frauenklinik, Bern. 140 Seiten. Verlag von Hans Huber, Berlin, 1936.

The influence of diet upon the vitamin content of the human breast milk and upon the development of the suckling is discussed. The relations of various influences, especially hormonal, upon the three phases of breast secretion are brought out.

There is a short section upon the vitamin content of the milk from the breast of the newborn. The conclusions summarize the vitamin needs of the nursing child compared with the vitamin content of human and cow's milk, and give valuable suggestions as to possible alterations in certain deficiencies of one or the other vitamins under such conditions in the mother as a previous pregnancy-toxemia in a suspected rickets of the newborn.

This subject is barely touched upon in the majority of textbooks of obstetrics, and the material here presented fills an undoubted gap in this phase of our care of the lactating woman.

—*Philip F. Williams*

This report of the *Proceedings of the First All-India Obstetric and Gynecological Congress,*[11] Madras, will be of interest to those who are concerned with the practice of Obstetrics and Gynecology in a country with so many types and customs in the social life as the people of India present. It should mark, too, an important beginning for the further developments of the specialty of Obstetrics and Gynecology in that country where today but one university, Madras University, is able to give postgraduate training in these subjects. In opening the Congress, Lord Ersking, Governor of Madras, paid special attention to the question of maternal mortality.

The material presented at the Congress followed three main topics: the third stage of labor, featuring papers on postpartum hemorrhage, placental pathology, and treatment of retained or adherent placenta; the second topic considered the subject of pelvic disproportion in its various aspects. There were presentations in this symposium on reviews of cases of dystocia, management of labor in contracted pelvis, cesarean section in infected cases, and a very able paper on the lower segment operation. It is evident that the advantages of the lower segment operation are well known in India, although it has not been performed extensively and the author summarizes by remarking: "This is an operation that has, in my opinion, come to stay; is a powerful weapon in our obstetrics armamentarium and has its maximum utility in controlled test labor cases." He remarks, however, that the actual performance of the procedure is outside the province of the occasional operator.

The gynecologic topics include a review of the use of radium and a discussion of the five-year cure of cancer of the cervix. Papers were presented on antenatal care, and on organization and conduct of child welfare schemes, and on infant mortality. The very timely paper on the value of postnatal care in which the author makes a plea for the establishment of postnatal clinics throughout India closes the proceedings. The topics selected for discussion in the next All-India Congress are Toxemias of Pregnancy and Cancer of the Cervix.

—*Philip F. Williams*

Being Born[12] is a short, attractive little book for boys and girls of the late grammar school and early high school age. The information it contains is very carefully and interestingly presented, with clear-cut, good illustrations describing all the processes connected with reproduction. Nobody who reads this will for a moment doubt the sincerity, wide experience and pedagogic skill of the author.

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[11] **First All-India Obstetric and Gynecological Congress, Madras;** January 2 to 4, 1936. Proceedings.

[12] **Being Born.** By Frances Bruce Strain. 144 pages. D. Appleton-Century Company, New York, 1936.

This book, if put in the hands of boys and girls, will help parents in having the facts of life presented in a wonderfully clear-cut fashion, in such a way that they need not dread the reaction of any normal child to this enlightenment.

—R. T. Frank

Pediatrics

The title page informs the reader that this book, *The Baby and Growing Child,*[31] is for physicians, mothers and nurses. The reviewer fails to discover much in the text of any value to the physician.

The best part of the publication is the illustrations.

There are some inaccurate statements, or at least questionable ones, which the author makes with some positiveness. For example, at the bottom of page one he starts the sentence which reads as follows: "The moment a woman reduces her weight by eliminating or reducing food, she automatically reduces the weight of the unborn infant," and again on page four he writes, "Shock, fright and sudden excitement during pregnancy may cause psychic disturbances in the newly born."

There is much useful information in the book but the uninformed reader, presumably the mother, would be unable to discriminate and be guided by that which is generally accepted as the best available opinion based upon our present knowledge.

It is difficult, perhaps impossible, to write a book which could harmonize varying ideas and practices. Probably no author could write a manual which would serve the threefold purpose of serving physicians, nurses and mothers. It would doubtless have been much better for Dr. Louis Fischer to have written a book with the single purpose of informing mothers.

—Fred L. Adair

Out of his unusually rich experience as a practicing pediatrician, the author has given the nursing profession a very valuable and practical textbook.[32] As usual in the writings of the author, he follows the simple, common sense attitude and prefers the tried methods to the experimental and theoretical ones. The book is divided into two parts: the first called "The Science" and the second "The Practice." In the first 26 chapters there is a concise summary of the essentials of pediatric knowledge for the use of nurses. In the final 22 chapters the practical application of this knowledge is discussed. As usually happens a strict separation of theory and practice is not quite possible. On the whole we agree with most of the statements of the author, but the chapter on child psychology could have been written along more useful lines. The instinct psychology of MacDougall's is not exactly the best foundation for child psychology. We would have liked to see an additional chapter on mental hygiene of childhood as applied to the work of the nurse.

—P. J. Zentay

Endocrinology

A very important contribution to endocrinology is *The Physiology and Pharmacology of the Pituitary Body*[33] by H. B. Van Dyke, now Professor of Pharmacology, Peiping University Medical College, China. The book is based on a huge and readily accessible bibliography which includes references to the year 1935. It is

[31]**The Baby and Growing Child.** Feeding and Health Care. By Louis Fischer, M.D., consulting physician of the Willard Parker Hospital, New York City, etc. Illustrated, 260 pages. Funk & Wagnalls Company, New York City, 1936.

[32]**Pediatric Nursing.** By John Zahorsky, M.D., Professor of Pediatrics and Director of Pediatrics, St. Louis University School of Medicine, with 144 illustrations in the text and 7 color plates, 568 pages. The C. V. Mosby Co., St. Louis, 1936.

[33]**The Physiology and Pharmacology of the Pituitary Body.** By H. B. Van Dyke, Professor of Pharmacology, Peiping Union Medical College, Peiping, China. 577 pages. The University of Chicago Press, Chicago, 1936.

not a volume designed for general reading but rather as a source book which embraces the most important and valuable contributions to this rapidly growing subject. It will be much appreciated by all others working in this same field.

The anatomy of the pituitary body is of course first considered. The effect of hypophysectomy and the results obtained with growth-promoting and gonadotropic extracts are taken up, as well as the lactation factor. Next the interrelationship between the pituitary and the other endocrine glands is considered. The physiology of other portions of the hypophysis, namely the pars intermedia and the pars neuralis, are described. A short appendix gives the scientific and commercial names of hormones as well as structural formulas of such hormones as have been identified.

—*R. T. Frank*

Endocrinology in Modern Practice[34] by Wolf has been written with the aim of supplying the practitioner with a textbook, "free from burdensome, technical and theoretical discussions," of clinical endocrinology. This book appears to be based largely upon study and adaptation of the enormous literature which has accumulated during the last decade rather than upon clinical experience. It is carefully planned and consistently executed. For each gland an introduction containing the anatomy, embryology, histology and, as far as known, biology and physiology, has been given. The fully worked out syndromes are well described. The diagnosis is clearly dealt with. Each chapter is concluded by a tabulated summary which gives a comprehensive view of the individual glands and their diseases. Good judgment has been displayed in not beclouding the issue by emphasis of the so-called pleuriglandular syndromes.

The contents of the book covers the pituitary gland, the ovaries, testes, thyroid, adrenal, parathyroid, thymus, pineal, the mammary gland, pancreatic islands, "other hormones" which include the liver, stomach, duodenum, pancreas, spleen, kidney, heart, placenta, hormones of the nervous system and antihormones. The author then takes up obesity, menstrual disorders, and the menopause and sterility. A large portion of the book is devoted to endocrine aspects of "non-endocrine" diseases which cover such diverse matters as pre- and postoperative considerations, suppuration, surgical and orthopedic diseases, the diseases of children, and of every one of the systems contained in the body.

An entire division of the book deals with endocrine diagnosis, including a comprehensive description of the interpretation of laboratory findings as well as diagnostic and laboratory procedures. A regional symptom diagnosis is given. A short chapter on endocrine preparations and their use concludes this volume of 1,018 pages.

There is no question that much of value has been gathered by the author; that he has kept in mind the limitations of the general practitioner in his knowledge in this field. The lucidity of his descriptions is admirable. His study of the literature is amazing in its completeness, although the lack of references makes investigation of the sources almost impossible.

A tremendous amount of material, unrelated to the subject of endocrinology, however, frequently confuses the issue. In some ways the book reminds me of Hare's *Practical Therapeutics and Diagnosis of Diseases*, but unfortunately our present state of knowledge makes me feel that this attempt is premature.

Lack of available space prevents my giving a complete review of the book. Under the pituitary diseases, syndromes, as yet not understood, are given, such as achondroplasia, adiposis dolorosa, Schüller-Christian disease, Mongolism, and Laurence-Biedl syndrome. The same applies to every other chapter which adds greatly to the size of the book.

Innumerable loose statements can be taken issue with. For instance, a third ovarian hormone "relaxin." Investigation has shown that this "relaxin" action

[34]**Endocrinology in Modern Practice.** By William Wolf, M.D. With 252 illustrations and 1,018 pages. W. B. Saunders Co., Philadelphia, 1936.

is ascribable to the estrogenic hormone. A statement that vitamin A and E deficiencies are "undoubtedly" responsible for a number of instances of hypoovarism. The author's views on the efficacy of testicular transplants from other species can certainly not pass muster. As long as this book aims to be so complete, scleroderma and Raynaud's disease should be described under parathyroid disturbances. Who will agree with the author that lipoma is "caused by faulty fat metabolism"?

—*R. T. Frank*

Correspondence

To the Editor:

Shortly after the publication in the July, 1934, issue of the AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY of the article "*An Endometrial Theory of Ectopic Pregnancy and an Intraligamentous Pregnancy at Six Months,*" written by Schenck and Frankel, I received a letter from Dr. J. B. Dawson, Professor of Obstetrics and Gynecology in the University of Otago, Dunedin, New Zealand. He drew to my attention an article on *Ovarian Pregnancy* which had been published by him in the *Medical Journal of Australia* for August 21, 1926, in which he had advanced the suggestion that an explanation of the occurrence of ectopic pregnancies may be found in the presence of ectopic endometrium in the ovary, tubes or pelvis, exactly the same theory independently arrived at and advanced by us in the article mentioned above.

In our article, due to an oversight, no reference was made to the paper of Dr. Dawson's, and his name was omitted from the list of references.

SAMUEL B. SCHENCK.

Brooklyn, May 29, 1937.

Items

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Dr. Frederick C. Irving, *Second Vice-President.*
Dr. Richard W. Te Linde, *Secretary.*
Dr. William C. Danforth, *Treasurer.*
Dr. Fred J. Taussig (4 years), Dr. Philip F. Williams (1 year), and Dr. Harold O. Jones (1 year), *members of Council.*

American Board of Obstetrics and Gynecology

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